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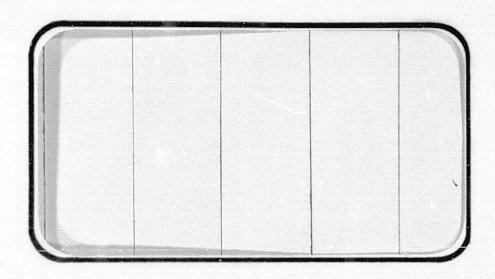
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# NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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(NASA-CR-141812) AN INVESTIGATION IN THE MSFC 14-INCH TWT TO DITERMINE THE STATIC STABILITY CHARACTERISTICS OF THE 0.004-SCALE MODEL (74-CTS) SPACE SHUTTLE VEHICLE 5 CONFIGURATION (IA33), VOLUME 2 (Chrysler G3,18 04915

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SPACE SHUTTLE

AEROTHERMODYNAMIC DATA REPORT



JOHNSON SPACE CENTER HOUSTON, TEXAS

DATA MANagement services



DMS-DR-2174 NASA CR-141,812

VOLUME 2 OF 3

AN INVESTIGATION IN THE MSFC 14-INCH TWT

TO DETERMINE THE STATIC STABILITY CHARACTERISTICS

OF THE 0.004-SCALE MODEL (74-OTS) SPACE

SHUTTLE VEHICLE 5 CONFIGURATION (IA33)

bу

E. C. Allen, Rockwell International

Prepared under NASA Contract Number NAS9-13247

bу

Data Management Services Chrysler Corporation Space Division New Orleans, La. 70189

for

Engineering Analysis Division

Johnson Space Center National Aeronautics and Space Administration Houston, Texas

#### WIND TUNNEL TEST SPECIFICS:

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# AN INVESTIGATION IN THE MSFC 14-INCH TWT TO DETERMINE THE STATIC STABILITY CHARACTERISTICS OF THE 0.004-SCALE MODEL (74-OTS) SPACE SHUTTLE VEHICLE 5 CONFIGURATION

(IA33)

by

E. C. Allen, Rockwell International

#### **ABSTRACT**

This report presents data for wind tunnel test (IA33) of a 0.004-scale orbiter, external tank, and solid rocket motor integrated vehicle model (74-OTS) in the MSFC Trisonic Wind Tunnel.

The primary test objective was to obtain data on the static stability characteristics in both pitch and yaw of the Shuttle Vehicle 5 over a Mach number range of 0.6 through 4.96. The effect on vehicle aerodynamic characteristics of tank and SRB nose shape, SRB nozzle shroud flare angle, and orbiter/ET fairing were investigated.

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- (C) (A) + CAF, CABT, CN, CLMF versus MACH
- (D) (B) + CY, CBL, CYN versus MACH
- (E) CN, CLMF, CAF versus ALPHA CN/DR, CLMDR, CAFDR versus MACH
- (F) CBL, CY, CYN versus BETA CYDR, CYNDR, CBLDR versus MACH
- (G) CN, CLMF, CAF versus ALPHA CN/DE, CLMDE, CAFDE versus MACH
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#### INTRODUCTION

The purposes of this test were: (I) to determine the static stability characteristics of the Shuttle Vehicle 5 configuration; (2) to determine the effect on the Vehicle 5 aerodynamic characteristics of ET and SRB nose shape, SRB nozzle shroud flare angle, orbiter to tank fairing, and sting location; (3) to provide flow visualization using thin film oil paint; and (4) to determine rudder, body flap, and inboard and outboard elevon hinge moments.

The mated vehicle model was mounted in three different ways: (1) the orbiter mounted on the balance with the SRB's attached to the tank and the tank in turn attached to the orbiter; (2) the tank mounted on the balance (with the sting protruding through the tank base) with the SRB's and orbiter attached to the tank, and (3) with the tank mounted on the balance and the balance in turn supported by a forked sting entering the nozzle of each SRB, extending forward into the SRB's then crossing over to the tank to provide a balance socket.

Data were obtained for Mach numbers from 0.6 through 4.96 at angles-of-attack and -sideslip from -10 to 10 degrees.

The Rockwell designation for this model is 74-OTS and the NASA Series number is IA33. The MSFC test number is TWT-594 A/B.

This report consists of 3 volumes arranged in the following manner:

VOLUME 1 - Plotted Data Figures 4-12 VOLUME 2 - Plotted Data Figures 13-26 VOLUME 3 - Tabulated Source Data

# NOMENCLATURE

Symbol	Plot Symbol	Definition
Ab		base area, in <sup>2</sup>
A <sub>be</sub>		tank base area, in. <sup>2</sup>
Abf		body flap area, in. <sup>2</sup>
Abf		orbiter/tank fairing base area, in. <sup>2</sup>
$A_{b_0}$		orbiter base area, in.2
$A_{b_S}$		SRB base area, in. <sup>2</sup>
bref	BREF	reference span, in. <sup>2</sup>
c.g.		center of gravity
CABE	CABE	tank base axial force coefficient
CAB <sub>F</sub>	CABF	orbiter/tank fairing axial force coefficient
CABO	CABO	orbiter base axial force coefficient
CABS	CABS	SRB base axial force coefficient
$c_{A_f}$	CAF	forebody axial force coefficient
CAT	CA	total axial force coefficient
$C_{\boldsymbol{\ell}}$	CBL	rolling moment coefficient in body axis system
C <sub>m</sub>	CLM	pitching moment coefficient
c <sub>mU</sub>	CLMU	uncorrected pitching moment coefficient
c <sub>n</sub>	ĆYN	yawing moment coefficient in the body axis system

# NOMENCLATURE (Continued)

Symbol	Plot Symbol	<u>Definition</u>
$c_{m_{f}}$	CLMF	forebody pitching moment coefficient
CAB	CABT	total base axial force coefficient
	CN/DR	normal force coefficient due to rudder deflection
	CLM/DR	pitching moment coefficient due to rudder deflection
	CAF/DR	forebody axial force due to rudder deflection
	CYDR	side force coefficient due to rudder deflection
	CYNDR	yawing moment coefficient due to rudder deflection
	CBLDR	rolling moment coefficient due to rudder deflection
	CN/DE	normal force coefficient due to elevon deflection
	CLMDE	pitching moment coefficient due to elevon deflection
	CAFDE	forebody axial force coefficient due to elevon deflection
	CYDE	side force coefficient due to elevon deflection
	CYNDE	yawing moment coefficient due to elevon deflection
	CBLDE	rolling moment coefficient due to elevon deflection
С <sub>ћео</sub>	CHEO	outboard elevon hinge moment coefficient
C <sub>hei</sub>	CHEI	inboard elevon hinge moment coefficient
$c_{hbf}$	CHBF	body flap hinge moment coefficient
c <sub>h</sub> r	CHR	rudder hinge moment coefficient

# NOMENCLATURE (Continued)

Symbol	Plot Symbol	Definition
CN	CN	normal force coefficient
CNBF	CNBF	body flap upper surface normal force coefficient, adjusted to freestream static pressure
cnb <sub>0</sub>	CNBO	orbiter base normal force coefficient
$c_{N_U}$	CNU	uncorrected normal force coefficient
CPB <sub>BF</sub>	CPBBF	body flap upper surface pressure coefficient
СРВЕ	СРВЕ	tank base pressure coefficient
CPB <sub>F</sub>	CPBF	orbiter/tank fairing base pressure coefficient
СРВ0	СРВО	orbiter base pressure coefficient
CPBS	CPBS	SRB base pressure coefficient
Сү	СҮ	side force coefficient (body or stability axis system)
<sup>l</sup> ref	LREF	reference length, in.
M	MACH	Mach number
MRP	MRP	moment reference point
	XMRP	moment reference point on x-axis
	YMRP	moment reference point on y-axis
	ZMRP	moment reference point on z-axis
P∞		freestream static pressure, psi
$P_{b_{bf}}$		body flap upper surface pressure, psi

# NOMENCLATURE (Continued)

Symbol	Plot <u>Symbol</u>	<u>Definition</u>
$P_{b_e}$		tank base pressure, psi
$P_{b_f}$		orbiter/tank fairing base pressure, psi
Pb <sub>o</sub>		orbiter base pressure, psi
$P_{b_S}$		SRB base pressure, psi
Pt		total pressure, psi
q	Q(PSI)	dynamic pressure, psi
RN/L	RN/L	Reynolds number per unit length; million/ft.
S <sub>ref</sub>	SREF	reference area, in. <sup>2</sup>
Sbfref		body flap reference area, in. <sup>2</sup>
Se <sub>ref</sub>		elevon reference area, in. <sup>2</sup>
Sr <sub>ref</sub>		rudder reference area, in. <sup>2</sup>
<b>T</b>		temperature, °F
α	ALPHA	angle-of-attack, angle between the projection of the wind $X_W$ -axis on the body $X$ , $Z$ -plane and the body $X$ -axis; deg.
β	ВЕТА	sideslip angle, angle between the wind $X_W$ -axis and the projection of this axis on the body $X$ , $Z$ -plane; deg.
8		control surface deflection angle; deg. positive deflections are:
•		aileron - left aileron trailing edge down
δe	ELEVTR	elevator - trailing edge down

# NOMENCLATURE (Concluded)

Symbol	Plot Symbol	<u>Definition</u>
$\delta_{\mathrm{BF}}$	BDFLAP	body flap - trailing edge down
δSB	SPDBRK	speed brake
δ <sub>r</sub>	RUDDER	rudder - trailing edge left
Δδ <sub>r</sub>	DRUDDR	rudder deflection increment
Δδε	DELEVN	elevator deflection increment
Mg		pitching moment, inlb.
SUBSCRIPTS	5	
be		tank base
bf		body flap
bo		orbiter base
b <sub>S</sub>		SRB base
е		elevator or elevon
<b>r</b>		rudder
SB		speed brake
eL & eR		elevon left and right
<b>t</b>		total conditions
<b>W</b>		wind
ref		reference conditions
∞		freestream conditions

#### CONFIGURATIONS INVESTIGATED

The model geometry (0.004-scale) is shown in figure 2a. The model was constructed entirely of stainless steel.

As described in the introduction, the model was mounted on the sting/balance combination in three different ways; (1) the orbiter mounted on the balance with the SRB's attached to the tank and the tank in turn attached to the orbiter (see figure 2a); (2) the tank mounted on the balance (with the sting protruding through the tank base) with the SRB's and orbiter attached to the tank (see figure 2b); and (3) with the tank mounted on the balance and the balance in turn supported by a forked sting entering the nozzle of each SRB, extending forward into the SRB's then crossing over to the tank to provide a balance socket (see figure 2c).

The model had positionable elevons and rudders which could be deflected (by installing a control surface set to the desired angle) to the following angles.

$$\delta_{eL} \& \delta_{eR} (deg) = -5, 0, 10, 15$$
  
 $\delta_{r} (deg) = 0, -15, -20 \text{ for } \delta_{SR} = 0$ 

The 0° rudder and the body flap were instrumented to provide hinge moments. The  $\delta_{eL}$  = 0° elevon was split and the inboard and outboard sections were both instrumented to provide hinge moments.

The model was fabricated in conformance with the lines drawings as listed below.

#### Orbiter

Forward Body and Cabin	VL70-000202C
Mid-body-wing/glove fairing	VL70-000200B
Aft body	VL70-000203
Vertical tail	VL70-000146A
Wing tip	VL70-006092
OMS/RCS Pods	VL70-008457
kon alang garaga	VL78-000041C
	VL77-000066

# CONFIGURATIONS INVESTIGATED (Continued)

The following nomenclature was used to designate model parts:

Сотро	nent	<u>Definition</u>	
<u>Orbiter</u>			
В6	2	fuselage - per VL70-000200B, 202C, & 203	
C1	2	canopy - per VL70-000202C	
E2	<b>6</b> . , ,	elevon - per VL70-000202B	
F	0 .	body flap - per VL70-000200B	
.W1	27	wing - per VL70-000200B	
Ml	4	OMS pods - per VL70-008457	
N2	8	OMS nozzle - per VL70-008457	
V8		vertical - per VL70-000146A	
R5		rudder - per VL70-000146A	
<u>Tank</u>			
АТ	16	attach structure, front ORB/ET - per SK-H-4011	
АТ	25	strengthened attach structure, left rear ORB/ET - per VL78-000062B	•
AT	26	strengthened attach structure, right rear ORB/ET - per VL78-000062B	
АТ	24	attach structure, front ORB/ET (ET alone) - per SK-H-4011	
FL	5	LOX feed line ET/ORB - per VL78-000062A	
	<b>6</b>	LH <sub>2</sub> pressure line ET/ORB - per VL78-000062A	:
FL	9 9	LH feed line ET/ORB - per VL78-000062A	. 1.

# CONFIGURATIONS INVESTIGATED (Continued)

	FR6	umbilical door fairing support - per VL78-000062A
	PT12	tank lightning rod - per VL78-000062A
	PT13	LOX recirculation line - per VL78-000062A
	PT14	LOX pressure line - per VL78-000062A
	PT20	LOX pressure line and electrical conduit per VL78-000062A
	PT21	tank base extension
	T20	tank - per VL78-000041C
	T27	tank with 1208 in. radius ogive nose, LOX pressure line, and electrical conduit
SRB		
	PS7	attach rings and rear structural ring - per VL77-000066
	PS8	electrical tunnel
	PS9	tie down structure - per VL77-000066
	S14	20° aft skirt
	\$15	28° nose shape
	S18	SRB baseline - per VL70-000066
The fol	lowing abbrevia	tions were used to describe the model con-

TIPI	Tank + protuberances
S1P2	SRB's + protuberances
01	Orbiter
T2	Tank long ogive nose

#### CONFIGURATIONS INVESTIGATED (Concluded)

S3	SRB 29° nose shape
F2	Orbiter/tank fairing
S2	SRB 20° aft skirt
El	Tank base extension

Details of the model components are given in table III. The various configuration components are illustrated by figure as indicated below:

- 1) Tank Protuberances, figure 2d and figure 2e.
- 2) Tank Long Ogive Nose and Tank Base Extension, figure 2f.
- 3) Orbiter/Tank Fairing, figure 2g.
- 4) SRB Protuberances, figure 2h.
- 5) SRB Alternate Nose Shape and Aft Skirt Flare, figure 2i.

#### INSTRUMENTATION

Balance number 239 was used throughout the test regardless of whether the balance was installed in the orbiter or in the tank. The model-balance combination for the balance in the orbiter tests was mounted to the tunnel pitch sector using the MSFC 5 degree offset sting with a straight extension. During the portion of the test for which the balance was in the tank and supported by the forked sting, the forked sting was mounted in the sector using the MSFC S-2 straight extension. When the balance was in the tank supported by a straight sting, the straight sting was mounted directly into the sector.

Pressure transducers were used to measure base pressures. Depending upon the model configuration as many as five base pressures were recorded. The configuration and associated base pressure measurement requirements are given below:

## Balance in Orbiter (see figure 2j)

1) Orbiter base pressure

$$P_{b_0} = 1, 2, 3, 5$$
 (all manifolded together)

2) Body flap base pressure

$$P_{bhf} = 4$$

3) Tank base pressure

$$P_{be} = 6, 7, 8 \text{ (all manifolded together)}$$

4) SRB base pressure

$$P_{b_s} = 9$$
, 10 (manifolded together)

# Balance in Orbiter + FRg (see figure 2j)

- $\begin{cases} 1\\2\\3\\4 \end{cases}$  Same as listed above
- Fairing base pressure

# INSTRUMENTATION (Concluded)

Balance in Tank (straight sting, see figure 2k)

Balance in Tank (forked sting, see figure 21)

- 1)
  2 Same as listed above
  3
- 4) SRB base pressure  $P_{h_{-}} = 9$

#### TEST FACILITY DESCRIPTION

The Marshall Space Flight Center 14" x 14" Trisonic Wind Tunnel is an intermittent blowdown tunnel which operates by high pressure air flowing from storage to either vacuum or atmospheric conditions. A Mach number range from .2 to 5.85 is covered by using two interchangeable test sections. The transonic section permits testing at Mach 0.20 through 2.50 and the supersonic section permits testing at Mach 2.74 through 5.85. Mach numbers between .2 and .9 are obtained by using a controllable diffuser. The range from .95 to 1.3 is achieved through the use of plenum suction and perforated walls. Mach numbers of 1.44, 1.93 and 2.50 are produced by interchangeable sets of fixed contour nozzle blocks. Above Mach 2.50 a set of fixed contour nozzle blocks are tilted and translated automatically to produce any desired Mach number in .25 increments.

Air is supplied to a 6000 cubic foot storage tank at approximately -40°F dew point and 500 psi. The compressor is a three-stage reciprocating unit driven by a 1500 hp motor.

Tunnel flow is established and controlled with a servo-actuated gate valve. The controlled air flows through the valve diffuser into the stilling chamber and heat exchanger where the air temperature can be controlled from ambient to approximately 180°F. The air then passes through the test section which contains the nozzle blocks and test region.

Downstream of the test section is a hydraulically controlled pitch sector that provides a total angle of attack range of  $20^{\circ}$  ( $\pm 10^{\circ}$ ). Sting offsets are available for obtaining various maximum angles of attack up to  $90^{\circ}$ .

#### TEST PROCEDURES

For the oil flow portion of the test, the model was prepared by filling the cracks and openings with polyester resin putty, finishing with thin coats of white lacquer for color, and sealing with a thin coat of clear lacquer to protect the color coat from contamination by the artist's oil pigment used for flow visualization.

The model was dual sting mounted on two MSFC 0.5 in. dummy balances, one installed in the external tank and the other in the orbiter. Stings were such that the orbiter and tank assembly could be separated easily for preparation, photography and clean up.

Black and white photographs of the flow pattern on the top, side and bottom of the orbiter and of the top of the tank assembly were taken.

The oil flows were obtained in accord with the thin film technique with artist's oil pigments as described in the SRO Rockwell Internal Letter from P. Hawthorne to R. Crowder, dated 28 October 1973.

Shadowgraphs of the model upright and rolled left 90° were made. These photos were taken during the force runs whenever possible and are available on request from the Aerodynamics Group, Shuttle Aero Sciences, Space Division, Rockwell International.

#### DATA REDUCTION

All model forces and moments (measured by the balance 239) were resolved in the body axis system and presented in the form of nondimensional coefficients. Data were corrected for weight tares and sting deflections. Data were also adjusted to be representative of a model with freestream static pressure acting on the orbiter base, orbiter body flap upper surface, External Tank base, and Solid Rocket Booster base. Orbiter, ET and SRB base pressures were recorded using tubes attached to the model sting with tube openings located near the base region. Comparison of base pressures sensed by these tubes with base pressures measured during other tests using pressure orifices located in the model skin indicated the tubes were not sensing an accurate base pressure. This error was due to the tube locations not being close enough to the model base, therefore measuring pressures in a region with appreciable flow velocities. Orbiter and ET base pressures were corrected for this (tube - tap) effect using the data presented in figure 2m, which was derived from a comparison of IA33 base pressures with base pressures from test IA53. Orbiter body flap upper surface pressures were determined using test IA81 data in addition to IA33 data, as shown on the curve in figure 2n. Coefficients were nondimensionalized as shown below.

#### INTEGRATED VEHICLE (TSO)

Balance Coefficients (Balance either in the orbiter or the external tank)

CNU = 
$$\frac{F_N}{qS_{ref}}$$
, normal force coefficient uncorrected for base pressure forces.

$${\sf CN} = {\sf CNU-CNB_0-CN_{BF}}$$
, normal force coefficient corrected for orbiter base pressure acting on the orbiter base and body flap.

CAT = 
$$\frac{F_A}{qS_{ref}}$$
, total axial force coefficient.

CAF = CAT - CAB
$$_0$$
 - CAB $_5$  - CAB $_5$ , forebody axial force coefficient.

CY = 
$$\frac{F\gamma}{qS_{ref}}$$
, side force coefficient.

CLMU = 
$$\frac{M_Y}{qS_{ref}}$$
, pitching moment coefficient uncorrected for base pressure forces.

$$CLM = CLMU + CNB_0 \frac{X_1}{\ell_{ref}} + CN_{BF} \frac{X_2}{\ell_{ref}} - CAB_0 \frac{Z_1}{\ell_{ref}},$$

pitching moment coefficient corrected for orbiter base pressure acting on the orbiter base and body flap.

$$CYN = \frac{MZ}{qSref\ bref}$$
, yawing moment coefficient.

$$CBL = \frac{M_X}{qSref bref}$$
, rolling moment coefficient.

$$CNB_0 = -CPB_{01A33}$$
  $\frac{A_{b0RB}}{S_{ref}}$  tan  $i_b$ , normal force component coefficient of orbiter base drag.

$$CNBF = -CPB_{bf} \frac{S_{bf_{ref}}}{S_{ref}}$$
, body flap normal force coefficient.

$$CAB_0 = -CPB_{0}$$
 A  $\frac{A_{b_0RB}}{Sref}$ , axial force component coefficient of orbiter base drag.

$$CABE = -CPB_{EIA33} \frac{A_{be}}{S_{ref}}$$
, tank base axial force coefficient.

CABS = -CPBS 
$$\frac{A_{bs}}{S_{ref}}$$
, SRB base axial force coefficient.

# Where:

$$CPB_{0}_{IA33} = \left(\frac{P_{b_0} - P_{\infty}}{q}\right)_{MEASURED} + \Delta CPBO$$

ΔCPBO is from figure 2m

$$CPB_{E_{1A33}} = \left(\frac{P_{b_e} - P_{\infty}}{q}\right)_{MEASURED} + \Delta CPBE$$

ACPBE is from figure 2m

CPB<sub>bf</sub> = C<sub>P</sub> as obtained from the curve on figure 2n for all datasets except AlCOO5, AlCOO6, AlCO23 and AlCO24

 $CPB_{bf} = CPB_{0_{1A33}}$  for datasets A1C005, A1C006, A1C023 and A1C024

## INTEGRATED VEHICLE PLUS ORBITER/ET FAIRING (TSO + F)

(Balance in the Orbiter)

All coefficients were computed as indicated above except for the following:

 $CAF = CAT - CAB_0 - CAB_S - CAB_E - CAB_F$ , forebody axial force coefficient

$$CLM = CLM_U + CNB_0 \frac{X_1}{\ell_{ref}} + CN_{BF} \frac{X_2}{\ell_{ref}} - CAB_F \frac{Z_2}{\ell_{ref}} - CAB_0 \frac{Z_1}{\ell_{ref}}$$

pitching moment coefficient corrected for base pressure acting on the orbiter base, body flap, and orbiter/ET fairing

CABF = 
$$-CPB_F$$
  $\frac{A_{b_f}}{S_{ref}}$ , fairing base axial force coefficient

Where:  $CPB_F = \frac{Pb_f - P_{\infty}}{q}$ , fairing base pressure coefficient

SECOND STAGE VEHICLE (TO)

(Balance in the external tank)

All coefficients were computed as indicated above except for the following:

 $CAF = CAT - CAB_0 - CAB_E$ , forebody axial force coefficient

EXTERNAL TANK ALONE (T)

$$CN = \frac{F_N}{qS_{ref}}$$
, normal force coefficient

 $CAF = CAT - CAB_F$ , forebody axial force coefficient

$$CLM = \frac{M_Y}{qS_{ref} \ell_{ref}}$$
, pitching moment coefficient

# Hinge Moment Coefficients

Rudder

$$c_{h_r} = \frac{HM_r}{qS_{rref} \bar{c}_r}$$

Where:  $C_{n_r}$  = rudder hinge moment coefficient

HMr = rudder hinge moment

 $S_{r_{ref}}$  = rudder reference area

c<sub>r</sub> = rudder reference length

# Elevon, Outboard

$$c_{h_{eo}} = \frac{HM_{eo}}{qS_{e_{ref}}\bar{c}_{e}}$$

Where:  $C_{h_{e0}}$  = outboard elevon hinge moment coefficient

 $\mathrm{HM}_{\mathrm{eo}}$  = outboard elevon hinge moment

S<sub>e</sub> = elevon reference area

c<sub>e</sub> = elevon reference length

# Elevon, Inboard

$$c_{h_{ei}} = \frac{HM_{ei}}{qS_{e_{ref}} \bar{c}_{e}}$$

Where: Choi = inboard elevon hinge moment coefficient

 $HM_{ei}$  = inboard elevon hinge moment

## Body Flap

$$c_{h_{bf}} = \frac{HM_{bf}}{qS_{bf_{ref}}c_{bf}}$$

Where:  $C_{h_{bf}}$  = body flap hinge moment coefficient

 $\mathsf{HM}_{\mathsf{bf}}$  = body flap hinge moment

 $S_{bf_{ref}}$  = body flap reference area

 $\bar{c}_{bf}$  = body flap reference length

Model reference dimensions used in the data reduction are:

PARAMETER	FULL SCALE	MODEL SCALE
Reference Areas		
S <sub>ref</sub> (wing)	2690.00 ft. <sup>2</sup>	6.198 in. <sup>2</sup>
S <sub>rref</sub>		
S <sub>e</sub> ref	210.00 ft. <sup>2</sup>	0.484 in. <sup>2</sup>
S <sub>bf<sub>ref</sub></sub>	142.6 ft. <sup>2</sup>	0.329 in. <sup>2</sup>

PARAMETER		FULL SCALE	MODEL SCALE
Reference Lengths			
eref = bref		1290.0 in.	5.160 in.
£ <sub>bf</sub> (distance from CG	to body flap)	1365.0 in.	5.46 in.
$\vec{c}_{\gamma}$		73.2 in.	0.293 in.
ē <sub>e</sub>		90.7 in.	0.363 in.
c <sub>bf</sub>		81.0 in.	0.324 in.
Moment Reference Point from ET base on ET ပြ		1199.8 in.	4.799 in.
Base Areas			
Orbiter (A <sub>bo</sub> )		314.10 ft. <sup>2</sup>	0.724 in. <sup>2</sup>
Orbiter (A <sub>boms</sub> )		122.57 ft. <sup>2</sup>	0.282 in. <sup>2</sup>
A <sub>bORB</sub>		436.7 ft. <sup>2</sup>	1.006 in. <sup>2</sup>
Tank (A <sub>be</sub> )		597.6 ft. <sup>2</sup>	1.377 in. <sup>2</sup>
Fairing (A <sub>bf</sub> )		79.7 ft. <sup>2</sup>	0.184 in. <sup>2</sup>
SRB (2)			
A <sub>bs</sub>			
$S_1$ and $S_3$ (baseline)		402.1 ft. <sup>2</sup>	0.926 in. <sup>2</sup>
S <sub>2</sub> (20° flare)		498.2 ft. <sup>2</sup>	1.148 in. <sup>2</sup>

# DATA REDUCTION (Concluded)

 $i_b = 14.75^{\circ}$ , average orbiter base slant angle.

 $X_1 = 5.052$  in., axial moment arm for orbiter base drag.

 $X_2$  = 5.346 in., axial moment arm for body flap.

 $Z_1 = 1.344$  in., vertical moment arm for orbiter base drag.

 $Z_2 = 0.730$  in., vertical moment arm for fairing base drag.

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# TABLE I.

# DATE: 4/24/74

## TEST CONDITIONS

MACH NUMBER	REYNOLDS NUMBER (per unit length)	DYNAMIC PRESSURE (pounds/sq.inch)	STAGNATION TEMPERATURE (degrees formenhell)	STAGNATION PRESSURE (pounds/sq inch)
0.6	5.0 x 10 <sup>6</sup>	4.35	100	22
0.8	6.0	6.45	100	22
0.9	6.2	7.36	100	22
0.95	6.4	7.74	100	22,
1.0	6.5	8.14	100	22
1.10	6.6	9.29	100	22
1.2	6.7	10.68	100	22
1.25	6.7	11.48	100	22
1.46	6.5	9.47	100	22
1.96	7,0	10.20	100	28
2.99	4.0	5.19	140	30
4.96	4.8	3.07	140	90

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MSF	$\sim$	-23	0
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	CAPACITY:	ACCURACY:	COEFFICIENT TOLERANCE:
NF	200 lbs.	±1.0 lb.	± 0.15
SF	100 lbs.	±0.5 lb.	± 0.08
AF	50 lbs.	±0.25 lb.	± 0.04
PM	196 in.lbs.	<u> ±1.0 in.lb.</u>	± 0.18
RM	98 in.1bs	±0.5 in.1b.	± 0.09
YM	50 in.lbs	±0.2 in.1b.	± 0.05

#### COMMENTS:

Accuracy based on  $\pm 0.5\%$  of balance capacity. Tolerance based on q=10 psi.

TABLE II.

TEST : MSF	C FWT 594 (IA33)			DAT	4 SE	T/RUN N	UMBE	R COL	LATIC	in Sum	MARY		DATE	: 9670	1y - 2	21 Jus	7e, 19	74
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007	TIPISIPEDI	A	0	O	0		10	130	129	120	126	127	109	122	108	107	131	EST
008		0	ß	0	O		10	115	114	1/3	117	112:	111	135	1	103	116	P.
009		5	ß	0	0		19	159	158	157	155	<u> </u>	191	136	160	161		N C M
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013		-5	В	-15	0		6	232		231	229	230		185		180		
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015		5	_	-20	0		6	224	<u> </u>	223	221	222		/83		/82_		
016			ß	-20	0			225	<u> </u>	226	228	127		186		179		
017		A	0	0	0		19		40	3	43			30	26	25		
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TABLE II. (Continued)

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041			0	B		1			5	208		207	205	206		191				
042			A	0		15			5	2/6		215	213	214		189				
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107	TIP, S, PZØ,	A	0	٥	٥			10	130	129	128	126	127	109	132	108	107	131	N.
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109		5	В	0	0			9	159	158	157	153	156	141	136	160	161		
110		-5	B	٥	0			9	145	144	1113	146	142	140	139	165	164		
111		A	0	-15	0			6	49		50	52	51		78		81		
1/2		5	B	-15	٥			6	217		218	220	219		184		181		
113		-5	В	-15	0			6	232		231	229	230		185		180		
114		A	0	-20	O			6	56		55	53	54		79		80		
115		5	ß	-20	0			6	224		223	221	222		183		182		
116		-5	ß	-20	0			6	225		226	228	227		186		179		
117		4	0	0	0			9	39	40	41	43	42	48	30	26	25		
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TABLE II. (Continued)

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	120	V	0	B				6	257		256	254	255		259		265		
	121	Tz Pi S3 P2 Ø1 F2	A	0				9	96	95	94	93	97	101	87	98	99	,. —	
	122	<u> </u>	•	B				6	91		90	92	89		88		100		
	123	T.P.O.	5	ß				6	151		152	154	153		137		162		
_	124	<u>\</u>	-5	ß	Ц_			6	150		149	147	148		138		163		1
	125	T.P. 52 P2 01	IA	0				9	57	58	59	61	60	110	27	83	82	,	
	126	<u> </u>	0	B		V		6	65		64	62	63		76		102		í
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X	128		0	B		-5													
	129		A	0		10		5	248		247	246	249	·	261				Ú
. !	130		0	B		10			252		251	253	250		258				
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TABLE II. (Continued)

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_ _	139		0	B	4_	-5			5	195		194	196	193		192	ļ		
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	141		0	B		10			5	208		207	205	206		191			
	142		A	0		15			.5	216		215	213	214		189			
$\perp$	143	<u> </u>	C	B		15			_5	209		210	212	211		190			
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TABLE II. (Continued)

	ATA SET	1001	594(IA.					RS/VA					N SUMA	·		DATE	EPENDE	NT VAE	PIARI F	······
1	ENTIFIER	CONF	TOURATION	a .	β	S.	Se				3/		0.9		<del>,</del>	·	1.96			
R.	2 C 201	7, 1	0	A	0		-			7			2	3	4		1	237	1	
T	202			0	B	_	-			7	16		15	13	14		17	240	24	
	203	T, P.	S, P2	0	B	-	-			7	9		10	11	12		20	239	21	
	204	,	7	A	0	-				7	8		7	6	5"		19	230	22	
	205	TIP	Ø,	A	0	٥	0			7_	122		123	125	124		/33	167	106	
1	206	,	1	0	В	0	0			7	121		120	118	119		134	166	105	
$\perp$	207	TiPiS	1 P2 Ø,	1	0	c	С			10	130	129	128	126	127	109	132	108	107	131
	208			0	B	0	ō_			10	115	114	1/3	117	112	111	135	104	103	116
$oldsymbol{\perp}$	209			5	B	0	0			9	159	158	157	155	156	141	136	160	161	
_	210	<del></del>		-5	ß	0	0			9	145	144	143	146	142	140	139	165	164	
	211			A	0	-15	0			6	49		50	52	51		78		81	
	2/2			5	ß	-15	0			6	217		2/8	220	219		184		181	
	213			-5	B	-15				6	232		231	229	230		185		180	
L	214			A	0	-20	0			6	56		35	53	54		79		80	
	215			5	В	-20	اء			6	224		223	221	222		183		182	
$\perp$	216	···		-5	B	-20	0			6	225		226	228	227		186		179	
$\perp$	317	····			0	٥	لے			9	39	40	41	43	42	48	30	26	25	
<u>Y</u>	218	·	/		B	0	0			6	47		46	44	45		29		28	
H	7 P		13 1	9	2	:5	:	31	····	37		43	49		55		61		67	
<u>ن</u>		<sub>β</sub> S	A = -10 B = -10	To 10	l	<u> </u>	لىي <u>3:2</u>	0 COI	EFFIC			1.1				* * * *	A A L	R (1)	IDVAR	(2) N

\* Lita UNRECORDED.

	<b></b>	temme trees		<del></del>				TAB	LE I	Ι. (	(Conti	nued)			<del> ,</del>					·	
į	TE	ST:Ms	FC TWT 594 (IA	33)		DAT	A SE	T/RU	N NU	мвег	S COL	OITA	4 SUMN	MARY	1	DATE	· · · · · · · · · · · · · · · · · · ·				
	Ē.	ATA SET	CONFIGURATION					ERS/V	ALUES	et CF								-	RIABLE		
1		NTIFIER		α	β	8-	Se			RUNS	0,6	0.8	0,9	1.10	1,25	1.46	1.96	2.99	4.96		
米	<i>R1</i>	C 219	T.P. S. Pzg1	A	0	0	0		<u> </u>	8	244	243	242	245	241	262	260	<u> </u>	264		_
米		220	Ψ	0	B		Ц_	<u> </u>		6	257		356	254	255		259		265		
		221	Tz Pi S3 Pz. O. F	2 A	0					9	96	95	94	93	97	101	87	98	22		
		222	- V	0	B			<u> </u>		6	91		90	92	89		88		100		
-		223	TiP. O.	5	B					6	151		152	154	153		137		162		
		224		-5	В					6	150		149	147	148		138		163		
		225	T.P. Sz. P2 01	A	٥					9	57	58	59	61	60	110	22	83	82		TEST
Į		226			ß		y			6	65		64	62	63		76		102		N C
	胨	227	TIPIS, P2 Q1	A	0		-5														NUMB
36	米	228		0	B		-5														J381
Ĭ		229		A	0		10			5	248		247	246	249		261				35
		230		0			10				252			253			258			!	1
	州	231		A			15				20.42			200							
d	*\	232			В	V	15														1
		233		o	B	-15	0			6	66		67	69	68		75"		177	<del></del>	
ı	1	234		0	B	-20	Ť	1		6	73		7 Z.		7/		74		178		-
ľ	1		TIP, S3P2 Ø1 F			٥	-			2	13		12	70				86	85		-0
ŀ	<del>-</del>	236	1.11 \$317 817	200		0		<b>}</b>		<del>-</del>									84		1
	<del></del>		4.2				<u> Y                                   </u>	<u> </u>						<u></u>	1					meri <del>namikan</del> ing sepi	حصداله
	<u> </u>		13	19		25		31		37		13	49	<del></del>	55	<del></del>	61		67	- Y	75 76
			<del></del>	<del></del>	_11			-ا <del>بالما</del> 00	EFFIC	ENTS	استحاست				<u> </u>		IDVA	R (1)	IDVAH	(2)	NDV
j		α OR					<del></del>			<del></del>			مسمورة فيلوبونس	~				<del></del>			
Ď.		SCHEDU	3-2 (Rev May 1972)																		# <del>181,#</del> 189

TABLE II. (Continued)

DATA SET		594(IA33					RS/VAI		NO.	COLL				L	DATE TE INDE		NT VAR	IABLE	)	_
DENTIFIER	CONF.	CURATION			Sr.					0.6	0.8	C.9	1.10	1.25	1.46	1.96	2,99	4.96		J
1C 237	Ø		1	0	0	0			9	172		F	3	4			175			
238	TIPIS	1/201	A	0		-5			5	200		199	197	198		187				
239			0	B		-5			5	125		194	196	193		192				4
240			A	0		10			5	201		202	204	203		188			ļ	
241			0	ß		10			5	208		207	205	206		191				4
242			A	Q		15			5	216		215	213	214		189				j
243		·	0	$ \mathcal{B} $		15			5	209		210	212	211		190				4
	01-6M	s PoDs)	A	0	V	0		ĺ	4	233			236							
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		· · · · · · · · · · · · · · · · · · ·		!						<u>_</u>	!			<u>.</u>		<u></u>				44.
	<u>.</u>	3 19			:5		31	···-	37		43	49		55		61	······································	67	<del></del>	75
	<del>1. 1. 1. 1. 1. 1.</del> .	<del></del>	السفسا				COE	FFIC	<u>                                     </u>	<u></u>	<u> </u>			<del></del>		10va		IDVAR	(2) 3	N
a or	β	····							a—											

TABLE II. (Continued)

recrea		<u></u>		·		Maria President			Conti	***************************************			•	DATE	,	<del></del>		
IESI -MS	FC THIT 594(IA3	31		DAT.	A SE	T RU	N NU	MBE	R COL	OITA	N SUMI	MARY		DATE				
DATA SET	TOMESTICS AT INV	<del></del>		·	Contractive Contra	ERS/V	ALUE	₩ OF	Berry adjusted to the	-				<del> </del>	EPENDE			1
IDENTIFIER		C C	β	\&- 	δε_	n==== 0.79	ļ	RUNS	0.6	10.8	6.2		-	144	1.26	2.99	4.96	14.05
91C 301	7, 1	1	0		<b></b> -	ļ	ļ	LZ.		ļ —	2	3	4	ļ	18	237	23	<u> </u>
302		0	B		<del></del>	<u> </u>	ļ	17	16	ļ	15	13	14		17	240	24	ļ
303	J. P. S. Pz	0	B		-	ļ		7	9	ļ	10	11	12	ļ	20	239	21	
304		A	0		_		ļ	17	8		7	6	5	<u> </u>	19	238	22.	
305	T.P.O.	A	0	c	C)			7	122		123	125	124		/33	167	106	
306	<u> </u>	<u> 0</u>	В	0	C	<u> </u>		7	121	<u>.</u>	120	118	119		134	165	105	
307	T.P.S.P.D.	11	0	0	a	<u> </u>		10	130	129	128	126	127	109	132	108	107	131
308		0	B	0	c			10	115	114	113	117	112	111	135	104	103	116
309		5	B	0	0			9	159	158	157	155	156	141	136	160	161	
310		-5	В	0	0			9	145	144	143	146	142	140	139	165	164	
311		A	0	-/5	٥			6	49		50	52	51		78		81	
3/2		5	B	-15	0			6	217			220	ì		184		181	
3/3		-5		-/5	0			6	232			229			185		180	
314		A	0	-20	C			6	56		55		54		79		80	
315		5	В	-20	0			6	224			22/			183		182	
316		-5	ß	-20	ð			6	225			228			186		179	
317		A	0	0	0			9	39	40	41		42	48	30	26	25	
V 318	<b>V</b>	0	В	0	0			6	47	.,.	46	44	45		29		28	
	7 13 19			25		31		37		43	49		55		61		67	7
H,E,O, , (	H.E.Z.		. 1	• • •		11,		- <del></del>							1			
		, 0			~ t	CC	EFFI	CENTS	<del>- 1 - 1 - 1</del>	<u></u>		<del></del>			IDVA	R(I)	IDVAF	
α OR	β S A=-10 TO , LES \$ B=-10 TO 1	0	<u> </u>	<u> </u>	<u>.</u>								<u></u>		<del></del>	· · · · · · · · · · · · · · · · · · ·		<u></u> _

MSFC - Form 263-2 (Rev. May 1973) \* DP TF 111 KECOK TF :

TABLE II. (Continued)

		A SET	CONFIG	JRATION	-	_	-		ERS/V	ALUES	# OF	-			<del></del>		<del></del>	·		RIABLE	}
-		TIFIER			C	<u> </u> β	<u> 2~</u>	. Se.	-			0.6	0.8	0.9	1.10	1.25	1.76	1.26	2.99	4.96	
	2 <u>C</u>	319	TIPI SI	P2 61	A	0	0	10	<del> </del>		8	244	243	242	245	241	262	260	<u> </u>	264	
L	<u> </u>	320	<u> </u>	<del> </del>	0	B		$\bot \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \!$			6	257		256	154	255		259		265	<u> </u>
L	<u> </u>	321	Tz Pi S3	P2 01 F2	1	0		11-	<u> </u>	ļ	9	26	95	94	93	97	101	87	98	29	
	<b> </b>	322			0	В		11_	<u> </u>	ļ	6	91		90	92	89		88		100	
_	<u> </u>	323	TIE	Ø,	5	B		<u> </u>			6	151		152	154	153		137		162	
L		324	4		<u> -s</u>	B	$\coprod$		<u> </u>		6	150		149	147	148		138		163	
		J25	TIP, Sz	P2 01	A	0			<u> </u>		9	57	58	59	61	60	110	77	83	82	
		326	. ↓		0	e		V			6	65		64	62	63		76		102	
74 147		327	TIP, SI	Prode	A		П	-5													
洪		328			٥			-5			-										
_		329			A			10			5	248		247	246	249		261			
		330			0	ß		10	1		5				253			258			
K		331			A	0		15	1	1											
il.		332			O	ß	1	15	<b> </b>												-
<u> </u>		333			0		-15	0			6	66		67	69	78		75		177	
		334	1		0	B	- 20	Ť	1		6	73		72	70	7/		74		178	
_			T.P. S3 P2	at. E.	Ā		0	H			2	75		16				-	86	85	
	i	336	<u>//// U3 12</u> .l	- W//2-	0		Δ				7								-	84	
<del></del>	<u> </u>			10				<u> </u>	<del></del>	<u> </u>								L	اسبوسيد		
-		7	13	19		<u> </u>	25		31		37		43	49		55_		61		<del>6</del> 7	
			<del>                                     </del>					<del></del>	<del>dalah</del> C	DEFFIC	<del></del>				<u> </u>	<u> </u>		LDVA	R (1)	IDVAR	(2)

TABLE II. (Continued)

	TA SET	, ,	ON F		AT:0% .	SC			Se		ALUES	a or	fig.	0.8								
R1	(33	7	Ø,		Separate on Englishme Property and Separate	A		[	0	77		9	172		170		~~~~~			·	1	
	338	Til	9,5	Pz	Ø,	1	0	T	-5			5	200		T	197			187			
	339			T		0	В		-5			5	195		1	196			192			
	340					A	0		10			5	201			204			188			
	341					0	В		10			3	208		207	205	206		191			
	343					A	0		15			5	216		215	2/3	214		189			
	343	<u> </u>	\	<u> </u>		0	B		15			5	209		210	2/2	211		190			
<u> </u>	344	10	(- Ø	MS	PODS)	1	0	<b>V</b>	0			4	233		234	236	235					
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l	·	7	1	13	19		2	:5		31		37		43	49		<del>\$</del> 5		61		67	
بــــ	لسبا		111		سلب			<u></u>		نبا		1	لبيا	سنبا	سلب		بال			لبب	<u></u>	لب

TABLE II. (Continued)

TEST : MS/	FC TWT 594(I	A 33		DAT	Y SE.	T/RUN NUI	ивег	S COLI	101TA_	4 SUMA	ARY		DATE	:				
DATA SET	CONFIGURATION	sc		- Carper - 1984		RS/VALUES	NO. OF	MA	CH NUM	BERS	ORAL	TERNA	TE INDE		NT VAR		-	
DENTIFIER		Œ	β	8-	Se.		RUNS	0.6	0.8	0,9	1.10	1.25	1:46	1.26	2.99	4.96	1.05	
R1C 401	T. P.	A_	0	-	بيدا		7			2	3_	4		18	237	23	<b> </b>	
402		0	B				7	16		15	13	14		17	240	24		
403	T. P. S. Pz	0	B	<u> </u>	<b>6</b>		7	9		10	11	12		20	239	21		
404			0	_	-		7	8		7	6	5	.,,	19	238	22		
405	T. P. O.	A	0	0	Đ		7	122		123	125	124		133	167	106		
406	<b>.</b>	0	$\boldsymbol{\mathcal{B}}$	0	٥		7	121		120	118	119		134	166	105		Į.
407	T. P. S. P2 0	O A	O	0	O		10	130	129	128	126	127	109	132	108	107	131	57
408		0	B	0	0		10	115	114	113	117	1/2	111	135	104	103	116	Š
409		5	ß	0	0		9	159	158	157	155	156	141	136	160	161	j	ΝÇ
410		-5		0	0		9			143			140	139	165	164		BEP
411		A	a	-15	0		6	49			52			78		81		ű
4/2		5		-15	0		6	217		218	220	219		184		181		
4/3		-5	B	-15	0		6	232		231	229	230		185		180		
414		A	0	-20	0		6	56			53			79		80		
415		5	ß				6	224			221			183		182		
416		-5		-20			6	225			128			186		179		
417		A	0	0	0		9	39	40	41		42	48	30	26	25		
V 418		0		0	0		6	47	· · · · ·	46	44	45		29		28		Ĺ
1 7	13	19		25	··	31	37		43	49	**************************************	55		61		67	7!	5 76
HBF		11			1.1		بنا							Like	لين		عاب	2e_L
	- d: -/s-	/- ° ,	/1	<u></u>	, Đ	COEFFIC	ENTS	i						IDVA	(F)	IDVAR	(2) N	DV
a OR	$\beta \propto A:-10$ ; LES $\beta = B:-10$	1010 ;	<u> </u>	<u> </u>	70	<del></del>	<del></del> -			<del> </del>								
	3-2 (Rev. May 1973)			***************************************					······································				***					-

\* Data UNKECORDEL

TABLE II. (Continued)

	CATA SÉ	i coi	NEICUPATION	<del></del>				ERS/v/	ALUES	OF.			<del>~~~~~</del>	<del></del>	~~~~	·	· · · · · ·	<del></del>	HABLE	
				and the first of the contract	THE COLUMN	<u>S-</u>	T _				1		1	]	1	\ <del>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</del>	1	2.99	4.96	g gande, madd diff <del>ang di</del>
	_		5, P2 Ø1			10	19		<del>                                     </del>	8	1	243	242		T	1		<b> </b>	264	
	42		Sold	<u> </u>		╂┼╴	+	<del> </del>	<u> </u>	9	257 96	95	256	254 93		101	259 87		265 99	
<u>-</u>	42	1	53 /2 011		B		-	1		6	91	/3	<del>                                     </del>	92	89	101	88	7.0	100	
	42.		Pid.	5	B		$\vdash$	1		6	151		1	154	<del></del>		137		162	
_	42	,	1/0/	-5		<u> </u>				6	150		· · · · · · · · · · · · · · · · · · ·	147			138		163	-
	4z.		Sz Pz Ø1	A						9	57	58	7	61		110	27	83	82	
	42	,	Ţ	0			V			6	65		64		63		76		102	
	421	TIPIS	1 /2 0/1		٥		-5													
ĸ	42			0	ß		-5													
	429			A	o		10			5	248		247	246	249		261			
	430	,			ß		10			5	252		251	253	250		258			
ď	431				0		15													
K	. 43	_			В	V	15													
_	435			0	В	-15	o			6	66		67	69	68		75		177	
4	437		Ψ	·····	ß	-20				6	73		72	20	71		74		178	
_			3 Pz. Ø, Fz		Ó	0		<b>  </b>		2							∤	86	85	
Y	430	1		101	B	0	Y												84	<del></del>
		7	13	19		25		31		37		13	49		55	·	61		67	7
		حست	<del></del>	سس					EFFIC		لسسا		سلس				سعنا	R (1)	1DVAR	421

TABLE II. (Continued)

TEST	115	FCTW	T 594 (TA3.							<del></del>			N SUMM			DATE					
	A SET	CONFI	GURATION			Sr	Se	RS/VA	LUES	8 ()F				والمسجد والمساور				2.99			T
91C	437	Ø,		7	0	O	0			9		1			1	T		175			
			P2 D1	A	0		-5			5	200		199	192	198		187				Ì
	439			0	B		-5		-	5	195		194	196	193		192			ļ	
	440			A	0		10			5	201		202	204	203		188			<del></del>	1
	441			0	В		10			5	208		207	205	206		191				
	442			A	0		15			5	216		215	213	214		189				
	443			0	B		15			5	209		210	212	211		190				ı
EV.		01-0	MS PODS)	A	0	V	0			4	233			236							
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### TABLE III. MODEL DIMENSIONAL DATA

MODEL COMPONENT : BODY - RES		
GENERAL DESCRIPTION Configuration	140 C, orbiter	fuselage, MCR
200-Rh. Similar to 140 A/B fuselage ex	xcept aft body r	evised and
improved midbody-wing-boot fairing, Xo :	= 940 to Y <sub>0</sub> = 10	10.
MODEL SCALE: 0.004		•
VL70-000140C, -000202	<b>2C,</b> 000205A, -03	0200B, -000203A.
DIMENSIONS:	FULL SCALE	MODEL SCALE
Length (IML: Fwd Sta. X <sub>o</sub> =238), I		5.161.
Length (OML: Fwd Sta Xo=235), I	n. 1203.3	5.173
Max Width(@ X <sub>o</sub> = 1528.3), In.	261.0	1.056
Max Depth (@ X <sub>0</sub> = 1464), In.	250.0	1.000
Fineness Ratio	<u>ls 639</u>	4.899
Area - Ft <sup>2</sup>		
Max. Cross-Sectional	250.885	0.0055
Planform		
Wetted		
Bose		

ORIGINAL PAGE IS OF POOR QUALITY

cabin No.	31 updated to MCR 200-Ri, . Us	ed with fuselar	e B <sub>62</sub> .
MODEL SCA	ALE: 0.004		
DRAWING N	IUMBER <u>VL70-000140C, -00020</u>	28, -000204	
DIMENSION		FULL SCALE	MODEL SCALE
L	ength (X <sub>0</sub> = 434.643-578), in.	143.357	0.573
	ax Width (@ X <sub>0</sub> = 513.127), In.	152.412	0.610
M	ax Depth ( $Z_0$ =501 to 449.39), II	1. 51.61	0.206
<b>F</b> i	neness Ratio		
Å	reo		
	Max. Cross-Sectional		
	Planform		

# TABLE III. MODEL DIMENSIONAL DATA (Continued) \*REVISED 4/24/74

MODEL COMPONENT: ELEVON - E36		
GENERAL DESCRIPTION: Configuration 1804/P		
	Orbiter elevons	
Data are for one side.		
MODEL COLLD		
MODEL SCALE: 0.0040 MODEL	DRAWING: SS-A001	48. RELEASE 6
DRAWING NUMBER: VI70-000200, -00	6089, -006092	
DIMENSIONS:	FULL-SCALE	MODEL SCALE
Area - Ft <sup>2</sup>		
어느 아이들이 이 맛이 되었다. 나는 아이를 다 가게 다	210.0	0.003
Span (equivalent), In.	349.2	1.397
Inb'd equivalent chord, In.	_118.00k	0.1472
Outb'd equivalent chord , In.	55.192	0.221
Ratio movable surface chord/ total surface chord		
At Inb'd equiv. chord	0.2096	0.2096
At Outb'd equiv. chord	0.4004	0.4004
Sweep Back Angles, degrees		
Leading Edge	0.00	0.00
, Trailing edge	10.056	-10_056
Hingeline	0.00	_0.60
*Area Moment (Product of area & c),Ft	1587.25	0.0001
*Mean Aerodynamic Chord, In.	90.7	0.363

MODEL COMPONENT : BODY FLAP -	F <sub>10</sub>	
GENERAL DESCRIPTION : Configurat	ion 140C body flap	Hingeline
located at X <sub>0</sub> = 1532, Z <sub>0</sub> = 238.		
MODEL SCALE: 0.0040		
DRAWING NUMBER	VI.70-355114	
DIMENSIONS:	FULL SCALE	MODEL SCALE
Length $(X_0=1525.5 \text{ to } X_0=160)$	513),In. <u>87.50</u>	0.350
Max'Width (@ L.E., X <sub>0</sub> = 152	25.5),In <u>256</u> .00	1.024
Max Depth (X <sub>0</sub> = 1532), In.	19.798	0.0792
Fineness Ratio		
Area - Ft <sup>2</sup>		•
Max. Cross-Sectional (	(@H.L.) <u>35,196</u>	0.00056
Planform	135.00	0.0022
Wetted		
Base $(X_0 = 1613)$	4.89	<u> </u>

MODEL COMPONENT: WING-W 107	(continued)	
SENERAL DESCRIPTION: Configuration 140C orbiter w	ing. MCE 200-Ru	similer to
140A/B wing Wilbut with refinements: improved		
$(X_0 = 940 \text{ to } X_0 = 1040)$ ; elevon split line relo	cated from Y_=2	81 to Y. =
MODEL SCALE: 0.0040		
TEST NO.	DWG. NO. VL7	0-0001400, -000200в
DIMENSIONS:	FULL-SCALE	MODEL SCALE
TOTAL DATA Area (Theo.) Ft <sup>2</sup>		
Planform Span (Theo In. Aspect Ratio	2690,00 936,68 2,265	0.043 3.747 2.265
Rate of Taper Taper Ratio Dihedral Angle, degrees	1.177 0.200 3.500	1.177 0.209 3.500
Incidence Angle, degrees Aerodynamic Twist, degrees Sweep Back Angles, degrees	0.500 3.000	0.500 3.000
Leading Edge Trailing Edge 0.25 Element Line		45.000 -10.055 -35.200
Chords: Root (Theo) B.P.O.O. Tip, (Theo) B.P.	680.24	2.757 -0.551
MAC Fus. Sta. of .25 MAC W.P. of .25 MAC B.L. of .25 MAC	474.81 1136.83 290.58 182.13	1 5.0 1 150 1 150
EXPOSED DATA  Area (Theo) Ft  Span, (Theo) In. BP108	1751.50	
Aspect Ratio	720.68 2.059 0.245	2.882 2.059 0.245
Root BP108 OF POOR QUALITY	562,09 137,85	2.2hB 0.551
MAC Fus. Sta. of .25 MAC W.P. of .25 MAC	398.83 1185.98 294.32	1.571 <u>4.740</u> 1.189
B.L. of .25 MAC Airfoil Section (Rockwell Mod NASA) XXXX-64	251.77	
Root b = 71p b =	0.113	0.113 0.12
Data for (1) of (2) Sides Leading Edge Cuff Planform Area Ft <sup>2</sup>		
Leading Edge Intersects Fus M. L. 0 Sta Leading Edge Intersects Wing @ Sta	113.18 500.00 1024.00	0.0018 2.000 4.096

MODEL COMPONENT : OMS POD - MILL		
GENERAL DESCRIPTION - Preliminary IMI	version of shor	t CMS pod.
(First used on 0.015 scale Model 36-0 f	or test No. 048	3).
MODEL SCALE: 0.0040		· · · · · · · · · · · · · · · · · · ·
DRAWING NUMBER VT.70-0081-57		
DIMENSIONS (For 1 of 2 sides).	FULL SCALE	MODEL SCALE
Length (OMS Fwd Sta Xo=1311), In.	254.00	1.016
Mox Width (@ X <sub>o</sub> = 1511), In.	135.6	0.5424
Max Depth (@ X = 1511), In.	73.6	0.2944
- Fineness Ratio	2.51080	2.54080
Area - Ft <sup>2</sup>	<del> </del>	· ·
Max. Cross-Sectional	54.507	0.00087
Planform		<del></del>
Wetted		
Base	J <del>ermanni</del>	

MODEL COMPONENT: OMS NOZZLES - N28		•
GENERAL DESCRIPTION: Configuration 140A/B Orbi	ter OMS nozzl	es
MODEL SCALE: 0.0040		
DRAVING NUMBER: VI70-000140A (Location): SS-A00	0106. RELFASE	5 (Contour)
DIMENSIONS:	FULL SCALE	MODEL SCALE
MACH NO.		
Length - In. Gimbal Point to Exit Plane Throat to Exit Plane		
Diameter - In. Exit Throat Inlet		
Area - ft <sup>2</sup> Exit Throat		· · · · · · · · · · · · · · · · · · ·
Gimbal Point (Station) - In.		
$f{x}$	1518.0 68.0 492.0	6.072 0.352 1.968
xboxer Nozzles X Y Z	1518.00 88.0 492.0	6.072 0.352 1.968
Null Position - Deg. Left**Doper Nozzle Pitch	_15 <sup>0</sup> lioʻ	15%191 _
Yaw Right XXXXX Nozzle	12-17	12 <sup>0</sup> 17'
re the first Pitch is the first of the first	15°49' 12°17'	15°49' 12°17'

#### \*REVISED 4/24/74 (Continued) MODEL DIMENSIONAL DATA

MODEL COMPONENT: VERTICAL - V 8		•
GENERAL DESCRIPTION: Configuration 140C o	rbiter vertical t	<u> </u>
(identical to configuration 140A/B vertical t	a11)	
MOLEL SCALE: 0.0040		
DRAWING NUMBER: VL70-000140C, -000146B		
DIMENSIONS:	FULL SCALE	MODEL SCALE
TOTAL DATA		
Area (Theo) - Ft <sup>2</sup>		
Planform	<u>413.253</u>	<b>0.</b> 0065
Span (Theo) - In.	315.720_	1.263
Aspect Ratio	1,675	
Rate of Taper	0.507	_0.507
Taper Ratio Sweep-Back Angles, Degrees.	0.404	0.404
Leading Edge	45,000	45.000
* Trailing Edge	26.2	26.2
0.25 Element Line	41.130	41.130
Chords:		
Root (Theo) WP	<u>268.500</u>	1.074
Tip (Theo) WP	108.470	0.434
na kalawa n <b>mac</b> a propinsi n <u>maka dil</u> aka njihina	<u> 199:808</u>	<b>0.</b> 799
Fus. Sta. of .25 MAC	1463.50	5.854
W.P. of .25 MAC B.L. of .25 MAC	635.522	2.5112
B. D. Of 129 MAC	0.000_	
Airfoil Section		
Leading Wedge Angle - Deg.	10.000	10.000
Trailing Wedge Angle - Deg.	14.920	14.020
Leading Edge Radius	2.00	<b>6.</b> 008
Void Area	13.17	0.00021
Blanketed Area	0.00	0.000

#### TABLE III. MODEL DIMENDIONAL DATA (Continued)

MODEL COMPONENT: RUDDER - RE		
GENERAL DESCRIPTION:	orbiter rudde	r (identical
MODEL SCALE: 0.0040		
DRAWING NUMBER: VL70-000146B, -0	00095	
DIMENSIONS:	FULL-SCALE	MODEL SCALE
Area - Ft <sup>2</sup>	100.15	0.0016
Span (equivalent) , In.	201.00	0.804
Inb'd equivalent chord , In.	91.585	0.366
Outb'd equivalent chord , In.	50.833	0.203
Ratio movable surface chord/ total surface chord		
At Inb'd equiv. chord	0.400	0.400
At Outb'd equiv. chord	0.400	0.400
Sweep Back Angles, degrees		
Leading Edge	34.83	34.83
Trailing Edge	26.25	26.25
Hingeline	34.83	34.63
Area Moment 1 Product of Area and c), Ft3	610.92	<u>_0,000039</u>
Mean Aerodynamic Chord	73.2	0.293

MODEL COMPONENT: ATTACH STRUCTURE - AT16

GENERAL DESCRIPTION: Forward orbiter/ET attach structure (2 member structure)

MODEL SCALE: 0.0040

MODEL DRAWING: SS-A00117

DRAWING NO.: VL78-000062B, SK-H-4011

n.		MODEL SCALE
en er myr graffyri i myr 🍂 mae 🛠 i cen er e	394.38	1.578
	0.00	0.00
	LWR ML	LWR ML
	1131.00	4.524
	561.298	0.187
and the state of t	561.298	2.245
	394.38	1.578
		0
그들 유민에 걸 그들 때문에는 사람들 하는 그는 사람이 없는 그리	LWR ML	LWR ML
	L131.00	4.524
	- 46.8	- 0.187
	561.298	2.245
Diameter of members: (In.)	5,70	0.0228

MODEL COMPONENT: ATTACH STRUCTURE - AT25

GENERAL DESCRIPTION: Strengthened attach structure, left rear orbiter to ET - 2 members.

MODEL SCALE: 0.0040

DRAWING NO.: VL78-000062B, VL78-000063

divensions:		FULL SCALE	MODEL SCALE
Member No. 1 (Aft):		1317.00	5.268
	<b>Y</b> o	- 96.50	- 0.386
	<b>. 2</b> 0	267.50	1.070
	X <sub>T</sub>	2058.00	8.232
	Ym	- 96.50	- 0.386
	Z <sub>T</sub>	515.50	2.062
	Diameter, In.	11.50	0.046
Member No. 2 (Forward):	X <sub>o</sub>	1317.00	5.268
	<b>Y</b> o	- 96.50	- 0.386
	<b>2</b> 0	267.50	1.070
	<b>X</b> p	1872.00	7.488
	Ϋ́π	- 125.88	- 0.503
	<b>Z</b> r	504.50	2.018
	Diameter, In.	15.50	0.062

MODEL COMPONENT: ATTACH STRUCTURE - AT26

GENERAL DESCRIPTION: Strengthening attach structure right rear Orbiter to ET - 2 members.

MODEL SCALE: 0.0040

PRAWING NO.: VL78-000062B, VL78-000063

DIMENSIONS:	FULL SCALE	MODEL SCALE
Member No. 1 (Aft) X <sub>o</sub>	1317.00	5.268
	96.50	0.386
	267.50	1.070
	2058.00	8.232
	96.50	0.386
an an antara da Africa da Araba da Africa da Araba da Ar Araba da Araba da Ar	515.50	2.062
Diameter, In.	11.50	0.046
Member No. 2 (Forward) X <sub>o</sub>	1317.00	5.268
	96.50	0.386
	267.50	1.070
	1872.00	7.488
	125.68	0.503
	504.50	2.018
Diameter, In.	15.50	0.062

MODEL COMPONENT: ATTACH STRUCTURE - AT24

GENERAL DESCRIPTION: Forward orbiter/ET attach structure (2 member structure) simulating the attach structure after ET separation.

MODEL SCALE: 0.0040	MODEL DRAWING: SS-A00117		
dimensions:	FULL SCALE	MODEL SCALE	
Member #1 X <sub>o</sub>	346.00	1.384	
	0.00	0.00	
	280.07	1.120	
Here $\mathbf{x}_{\mathbf{r}}$ , which is the second constant $\mathbf{x}_{\mathbf{r}}$ . The second $\mathbf{x}_{\mathbf{r}}$	1131.00	4.524	
in in 1907. Geografia - Monte Giano, escape <mark> Yo</mark> Georgia, de	46.∞	0.184	
	565.07	2.260	
Member #2 X <sub>o</sub>	346.00	1.384	
	0.00	0.00	
	280.07	1.120	
	1131.00	4.524	
	- 46.00	- 0.184	
	280.07	1.120	
Diameter of Members, In.	5.70	0.0228	

MODEL COMPONENT: FEEDLINE - FL5

GENERAL DESCRIPTION: LOX feedline simulated between ET and Orbiter.

MODEL SCALE: 0.0040 MODEL DRAWING: SS-A00117

DRAWING NO.: VL78-000062B

DIMENSIONS:	FULL SCALE	MODEL SCAL
Leading edge at:	1033.3	4.132
	70.0	0.280
	1033.3	4.132
	- 70.0	- 0.280
Trailing edge at: X <sub>T</sub>	2071.50	8.286
	70.00	0.280
	2071.50	8.286
후보는 현실을 내려가 되는 모든 사람들은 보고 하는 경우 다 하는 기술을 받 그는 사람들은 사람들은 사람들은 사람들은 사람들은 사람들은 사람들은 사람들은	70.00	0.280
Diameter, In.	18.80	0.188

Centerline of LOX feedline located radially at  $\emptyset = 23^{\circ}24^{\circ}$ 

MODEL COMPONENT: PRESSURE LINE - FLG

GENERAL DESCRIPTION: Max. cross-sectional area simulating LE2 pressure line and electrical conduit box between ET and Orbiter.

MODEL SCALE: 0.0040

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		178-000062в		The 4 P	SS-A00117
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THE PROPERTY.	10. : VI	1 (C) TUNNATUE D		THE PARTY OF THE P	DOSEMBLY

DIM	ensions:		FULL SCALE	MODEL SCALE
	Leading edge at:	X <sub>T</sub>	1127.1	4.508
		Y <sub>T</sub>	110.3	0.441
	Trailing edge at:	X <sub>T</sub>	2062.1	8.248
		Y <sub>T</sub>	110.3	0.441

Centerline of LH pressure line located radially at  $\phi = 33^{\circ}45^{\circ}$ .

Model sc	ALE: 0.00	40			
DRAWING	NUMBER	VL78-000062	В		
DIMENSIO	NS:		FULI	- SCALE	MODEL SCALE
	<b>Centerline</b>	at X		071.5	8.286
	Max Width		-	31.2	0.125
	Max Depth			37.5	0.150
	Diameter			17.0	9.068
	Area				
	Na.	Cross-Sectional			

MODEL COMPONENT: REAR ATTACH STRUCTURE FAIRING - FRG

GENERAL DESCRIPTION: Rear ET/Orbiter attach structure cross-member or

beam fairing used in conjunction with AT12, AT13, FL and FL2.

MODEL SCALE: 0.0040

DRAWING NO.: VL78-000062B MODEL DRAWING: SS-A01256

DIMENSIONS:			FULL SCALE	MODEL SCALE
Leading	edge centerline at	X <sub>T</sub>	2036.67	8.147
		YT	0.00	0.00
		<b>Z</b> T	183.00	0-732
Maximum	length, In.		64.00	0.256
Maximum'	width, In.	y muliture en	190.00	0.760

MODEL COMPONENT: ET PROTUBERANCE - PT12

GENERAL DESCRIPTION: Lightning rod attached to ET nose.

MODEL SCALE: 0.004

 $\bigcup$ 

DRAWING NO.: VL78-000068A

dimensions:		FULL SCALE	MODEL SCALE
Length	•	30.90	0.124
Diameter, In.		3.20	0.013

MODEL COMPONENT: ET PROTUBERANCE - PT.1.3

GENERAL DESCRIPTION: Maximum cross-sectional area simulating LOX recirculation line and electrical conduit box on planform view of External Tank,  $T_{20}$ .

MODEL SCALE: 0.0040

MODEL DRAWING: SS-A00117

DRAWING NO.: VL78-000062B

dimensions:		FULL SCALE	MODEL SCALE
Leading edge at:	× <sub>T</sub>	_ 1208.3	4.833
•	YT	+ 95.0	+ 0.380
	$\mathbf{x_T}$	1208.3	4,833
	$\mathbf{Y}_{\mathbf{T}}$	- 95.0	- 0.380
Trailing edge at:	ХŢ	2060.5	8.242
	$\mathbf{Y_T}$	95.0	0.380
<u>.</u>	$\mathbf{x_T}$	2060.5	8.242
	$\mathbf{Y}_{\mathbf{T}}$	- 95.0	<b>- 0.3</b> 80

Centerline of LOX recirculation line located radially at  $\phi = 33^{\circ}45^{\circ}$ .

MODEL COMPONENT: ET PROTUBERANCE - PT14

GENERAL DESCRIPTION: LOX pressure line on Tank T20.

MODEL SCALE: 0.0040

( ]

DRAWING NO .: VL78-000062B

DIMENSIONS:		FULL SCALE	MODEL SCALE
Leading edge at:	X <sub>T</sub>	355.90	1.424
•	YT	6.0	0.024
Trailing edge at:	x <sub>T</sub>	<b>20</b> 60.5	8.242
. `	YT	.87.0	0.348

Centerline of LOX pressure line located radially at  $\emptyset = 23^{\circ}24^{\circ}$ .

MODEL COMPONENT: NOSE COME LINES - PT20

GENERAL DESCRIPTION: Maximum cross-sectional area simulating the LOX pressure line and electrical conduit on top of external tank  $(T_{20})$  nose cone area.

MODEL SCALE: 0.0040

DRAWING NO .:

DIMENSIONS:		FULL SCALE	MODEL SCALE
Leading edge at:	X <sub>T</sub>	<b>360</b> .92	1.444
	YT	34.0	0.136
Trailing edge at:	$\mathbf{x}_{\mathbf{T}}$	955-1	<b>3.8</b> 20
•	YT	336.5	1.346

Centerline of lines located radially at  $\emptyset = 33^{\circ}45'$ .

MODEL COMPONENT: Tank base extension - PT\_21

GENERAL DESCRIPTION: Cylindrical base extension on external tank, T20.

MODEL SCALE: 0.0040

DRAWING NO.: VL72-000131, VL78-000062

MODEL DRAWING: LMSC R80058

DIMENSIONS:	FULL SCALE	MODEL SCALE
Length, In-	428.25	1.713
Diameter, In. Area - Ft <sup>2</sup>	330.20	1.321
Max. Cross-sectional	594.679	2.379
Base	594.679	2.379
WP of Extension centerline	400.00	1.600

MODEL COMPONENT : EXTERNAL TANK - To	)	
GENERAL DESCRIPTION: External Oxygen-	lydrogen tank	
• •		
MODEL SCALE: 0.0040		
DRAWING NUMBER: VI.72-000131, VI.78-00	00062	
DIMENSIONS:	FULL SCALE	MODEL SCALE
Length, In. (Nose @ X <sub>0</sub> =328.92)	1846.905	7.388
Mox Width Dia, In. @ Xo=975.675	333_2	1.333
Max Depth , In.	330.2	1.333
Fineness Ratio	5.65713	5.65713
. Area - Ft <sup>2</sup>		
Max. Cross-Sectional	605.534	0.0096
Major Cross section	<u>594.679</u>	0.0095
WP of tank centerline (Z)	,In. 400.000	0.0064
Base (on 330.2 dia.)	594.679	0.0095

MODEL COMPONENT : EXTERNAL TANK -	<sup>T</sup> 27	
GENERAL DESCRIPTION : External tank	T20 with 1208 I	a. radius osive
nose		
	· · · · · · · · · · · · · · · · · · ·	
MODEL SCALE: 0.0010 MODE	EL DRAWING: LMS	C R80058
DRAWING NUMBER :	00062	
		· .
DIMENSIONS:	FULL SCALE	MODEL SCALE
Length , In. (@ X <sub>o</sub> =328.92)	<u> 1947-155</u>	<del>- 7.78</del> 9
Max. Dia, In. (@ X <sub>T</sub> = 975.675)	333.2	1_333
Major Diameter, In.	330.2	1.333
Fineness Ratio	5.807	5.897
Area - Ft <sup>2</sup>		
(@ X <sub>p</sub> 975.675) Max. Cross-Sectional	605.534	0,0097
Major Cross-section Plonform	594.679	0.0095
Wetted		
Bose (on 330.2 dia.)	594.670	0,0005
WP of tank centerline (Z)	400.00	0.0064

MODEL COMPONENT: SRB PROTUBERANCE - PS7

GENERAL DESCRIPTION: SRB/EF attach ring: two attach rings and one structural

ring.

MODEL SCALE: 0.0040

DRAWING NO .: VL77-000066

DIMENSIONS (DATA FOR 1 OF 2):	FULL SCALE	MODEL SCALE
Centerline at XB	1505	6.020
	1517	6.068
	1852	7.408
Width	10	0.040
Heigth	10	0.040

MODEL COMPONENT: ELECTRICAL TUNNEL - PS8

GENERAL DESCRIPTION: Electrical tunnel on wall of solid rocket motor

booster.

MODEL SCALE: 0.0040

DRAWING NO.: VL77-000036A

DIMENSIONS:	FULL SCALE	MODEL SCALE
Length, In.	1341.5	5.366
Width , In.	6.0	0.024
Height, In.	3.0	0.012
Leading edge angle (Deg.)	18	18

Model Component: The-Down Structure - PS-9

GENERAL DESCRIPTION: Tie-down lugs on shroud of solid rocket motor booster.

MODEL SCALE: 0.004

DRAWING NO.: VL77-000066

DIMENSIONS:	FULL SCALE	MODEL SCALE
Number of tie-down lugs	4	4
Length, In.	64.00	0.256
Width, In.	13.00	0.052
Max. Height (at T. E.)	8.334	<b>0.</b> 033
Angular position (from vertical), Deg.	60	60

MODEL COMPONENT: BOOSTER, SOLID ROCKET MOTOR - S14

GENERAL DESCRIPTION: SRB with 20° aft skirt

MODEL SCALE: 0.004 MODEL DRAWING: LMSC R80055, R80056

DRAWING NO .: VL77-000066

(1)

DIMENSIONS:	FULL SCALE	MODEL SCALE
Length (includes nozzle), In.	1789.40	7.158
Tank diameter, In.	146.00	0.584
Aft skirt diameter, In.	213.70	0.855
Skirt flare angle	20°	50°
Fineness ratio:	12.256	12.256
Area - Ft <sup>2</sup>		
Max. Cross-sectional (tank)	116.261	<b>0.001</b> 9
Max. cross sectional (skirt)	249.079	<b>0.0</b> 040
WL of BSRM centerline ( $Z_{\mathrm{T}}$ )	400.00	1.600
FS of BSRM nose (X <sub>T</sub> )	743.00	2.972
BP of BSRM centerline (Ym)	250.5	1.002

MODEL COMPONENT: BOOSTER, SOLID ROCKET MOTOR - S15

GENERAL DESCRIPTION: SRB with 28° nose

MODEL SCALE: 0.004 MODEL DRAWING: LMSC R80055, R80056

DRAWING NO .: VL77-000066

dimensions:	FULL SCALE	MODEL SCALE
Length (includes nozzle), In.	1846.40	7.386
Tank diameter, In.	146.00	0.584
Aft skirt diameter, in.	192.00	0.768
Nose planform angle	28°	28°
Nose side view angle	140	140
Fineness ratio	12.647	12.647
Area - Ft <sup>2</sup>		
Max. cross-sectional (tank)	116.261	0.0064
Max. cross-sectional (skirt)	201.062	0.0032
WL of BSRM centerline (Z <sub>T</sub> )	400.00	1.600
PS of BSRM nose (X <sub>T</sub> )	743.00	2.972
BP of BSRM centerline (YT)	250.5	1.002

MODEL COMPONENT: BOOSTER SOLID ROCKET MOTOR - S18		
GENERAL DESCRIPTIONConfiguration	MCR 500. Data f	or 1 of 2 sides
		•
MODEL SCALE: 0.0040		
DRAWING NUMBER		
•	•	
DIMENSIONS:	FULL SCALE	MODEL SCALE
Length (Includes nozzle), In.	1989.4	7.958
Mox Width (Tank dia.), In.	146.0	_0.58lı
Max Depth (Aft shroud), In.	192.0	0.768
Fineness Ratio	9.06771	9 06771
Area - Ft <sup>2</sup>		
Max. Cross-Sectional	201.06193	- 0.0032
Planform	·	-
Wetted		
Base:		<del></del>
WP of BSRM centerline ( $Z_T$ ), In.	400.00	1.600
FS of BSRM Nose (XT), In.	743.00	2.972

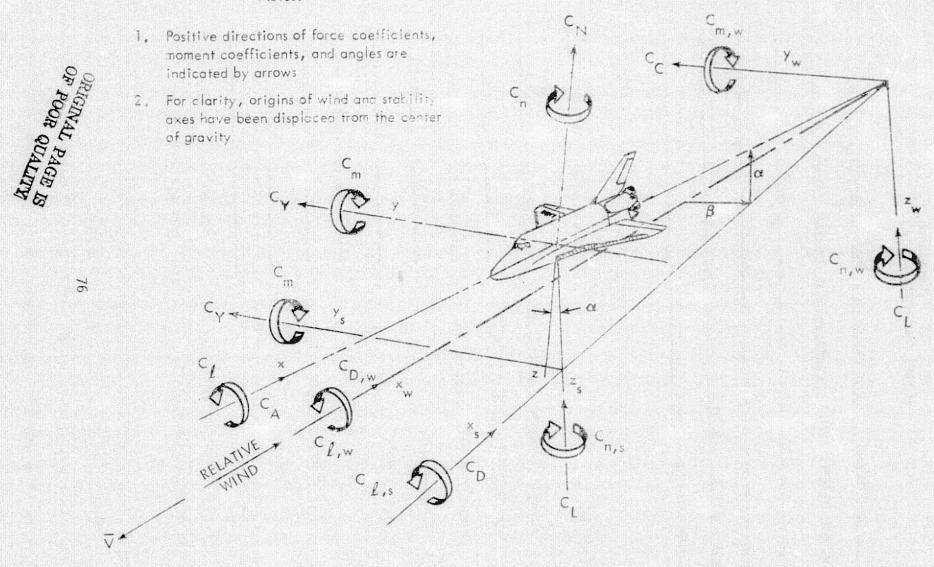
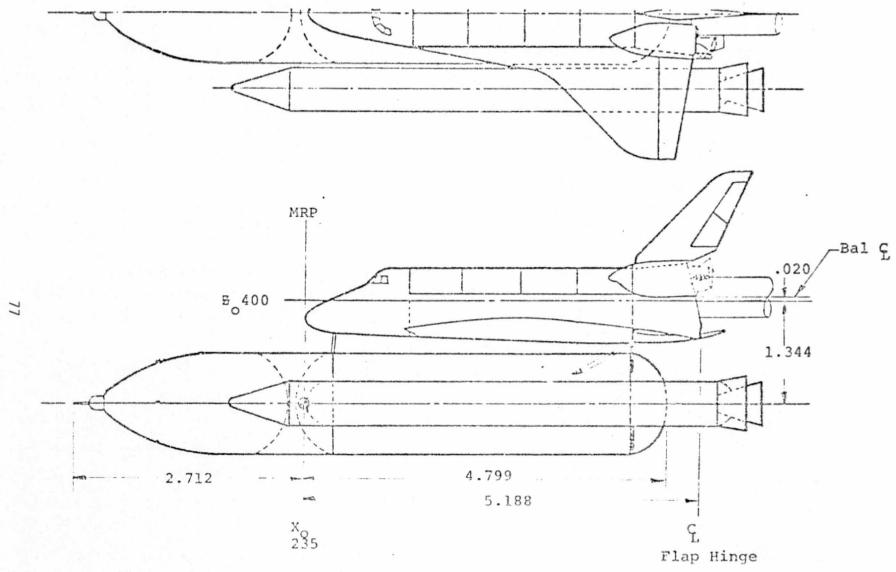
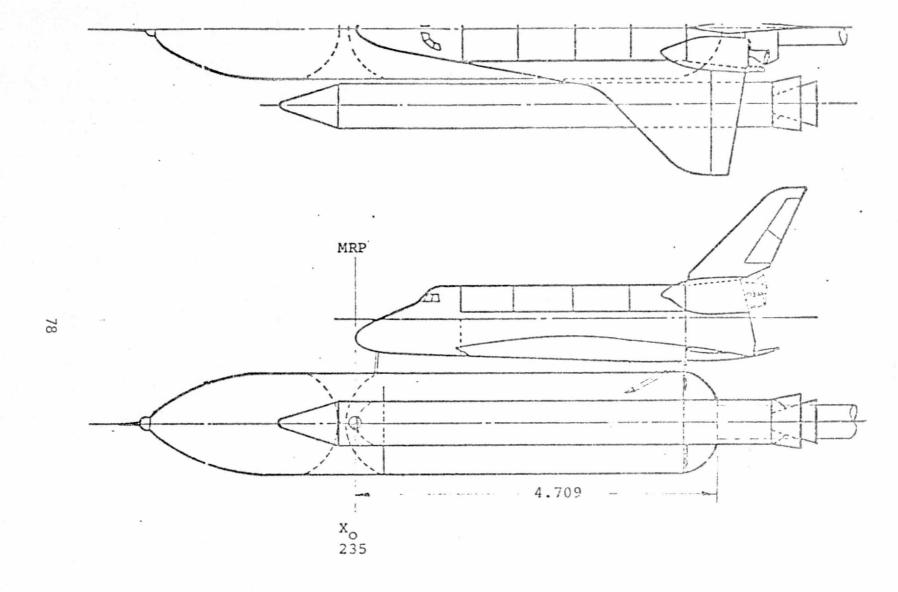


Figure 1. Axis Systems

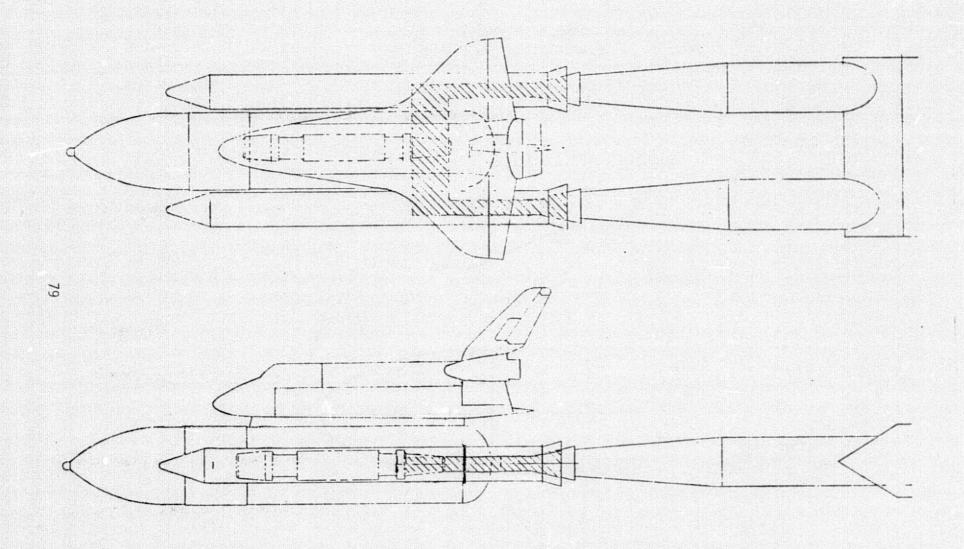


 General Arrangement of Launch Vehicle Model (Balance In Orbiter)

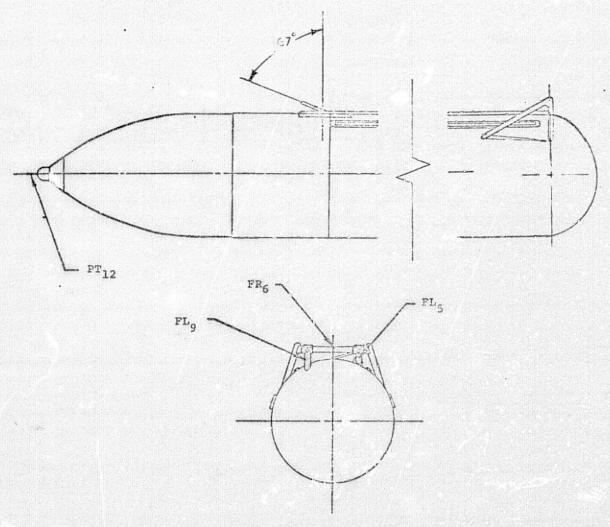
Figure 2. - Model Sketches and Graphs.



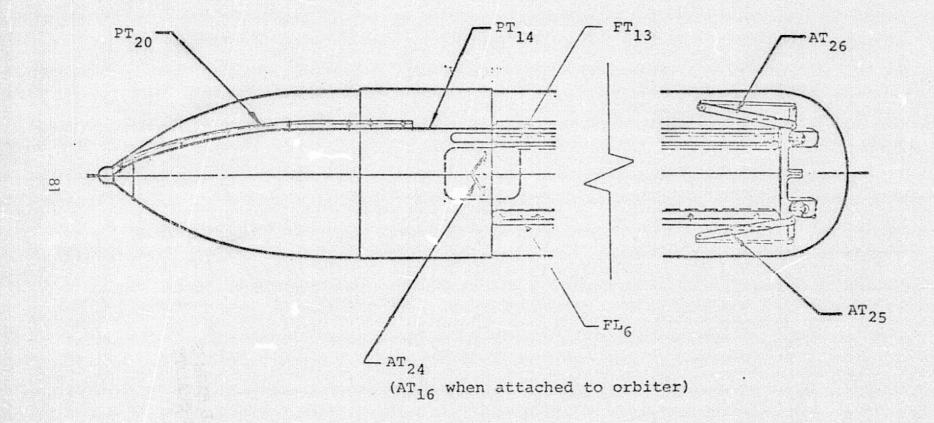
 General Arrangement of Launch Vehicle Model (Balance in Tank, Straight Sting) Figure 2. - Continued.



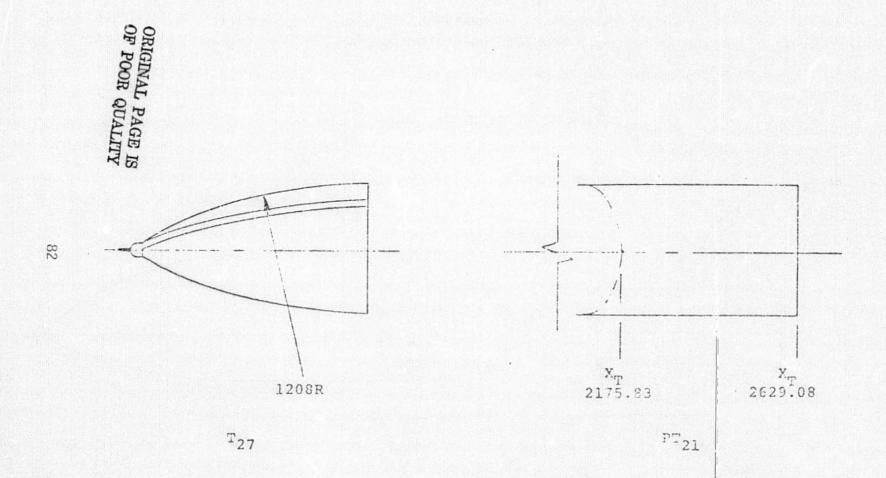
 General Arrangement of Launch Vehicle Model (Balance in Tank, Forked Sting) Figure 2. - Continued.



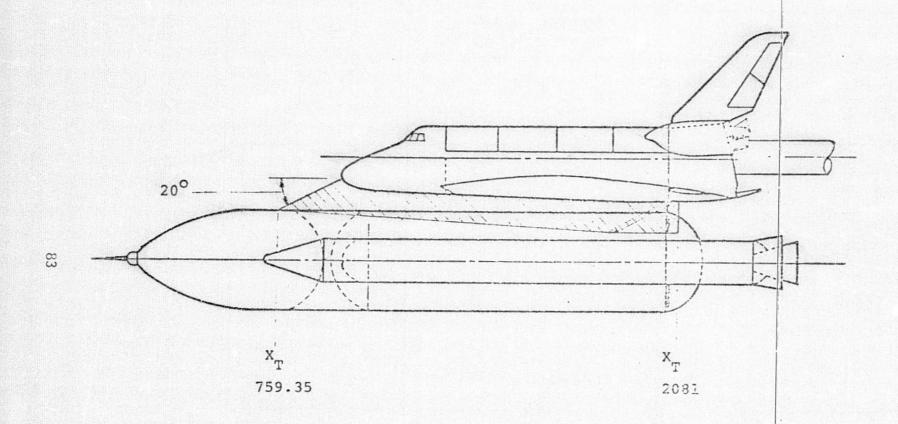
d. Tank (T<sub>20</sub>) Protuberances - Side View Figure 2. - Continued.



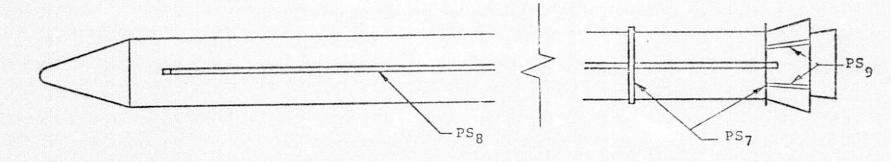
e. Tank  $(T_{20})$  Protuberances - Top View Figure 2. - Continued.

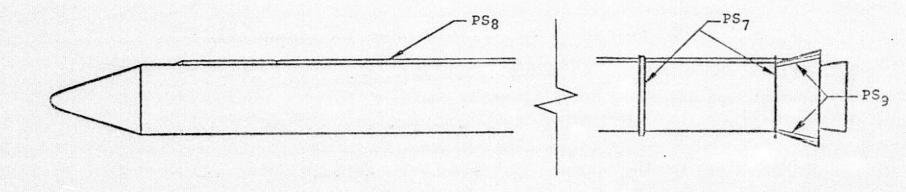


f. Tank Long Ogive Nose ( $T_{27}$ ) and Base Extension ( $PT_{21}$ ) Figure 2. - Continued)

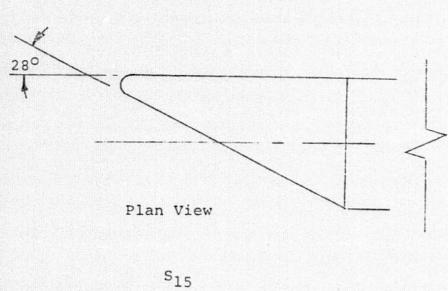


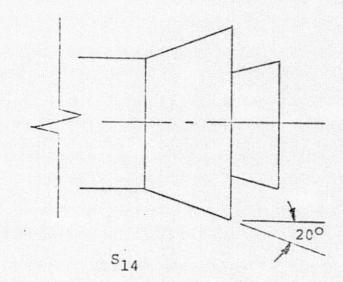
g. Orbiter/Tank Fairing,  $FR_9$  Figure 2. - Continued.

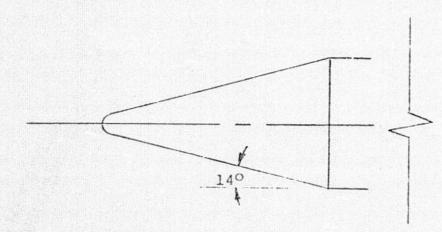




h. SRB ( $S_{18}$ ) Protuberances Figure 2. - Continued.

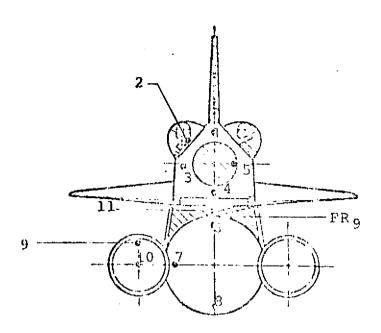






Side View

i. SRB Alternate Nose Shape ( $S_{15}$ ) and Aft Skirt Flare ( $S_{14}$ ) Figure 2. - Continued.



#### BALANCE IN ORBITER

Manifold tubes as follows:

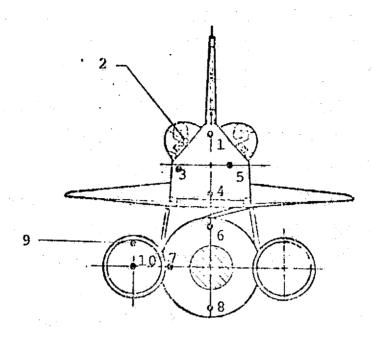
with  $FR_g$  Installed

$$P_{\mathbf{b_f}} = 11$$

of Base Pressu actions, Balance in Orb Figure 2. - Continued.

PAGE IS

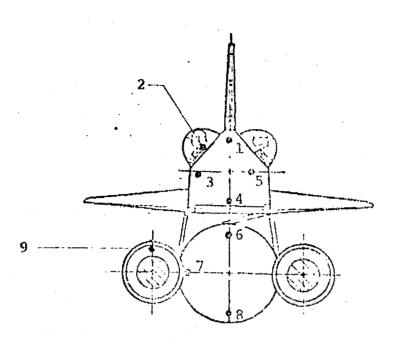
ORIGINAL PAGE IS Definition of Base Pressure Tube Locations, Balance in Orbiter



BALANCE IN TANK (Straight Sting)

Manifold tubes as follows

 Definition of Base Pressure Tube Locations, Balance in Tank (Straight Sting)
 Figure 2. - Continued,

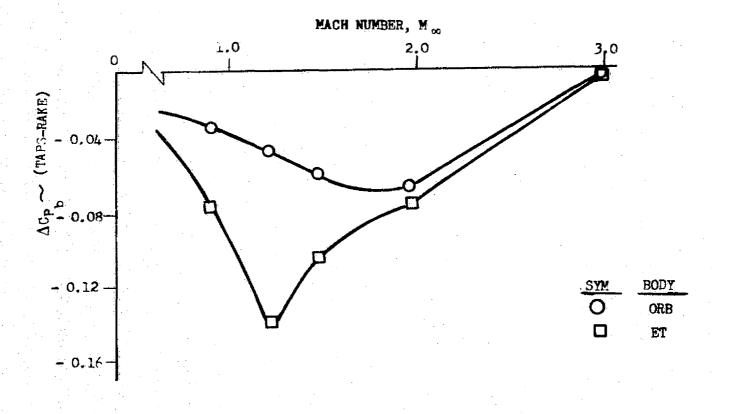


#### BALANCE IN TANK (Forked Sting)

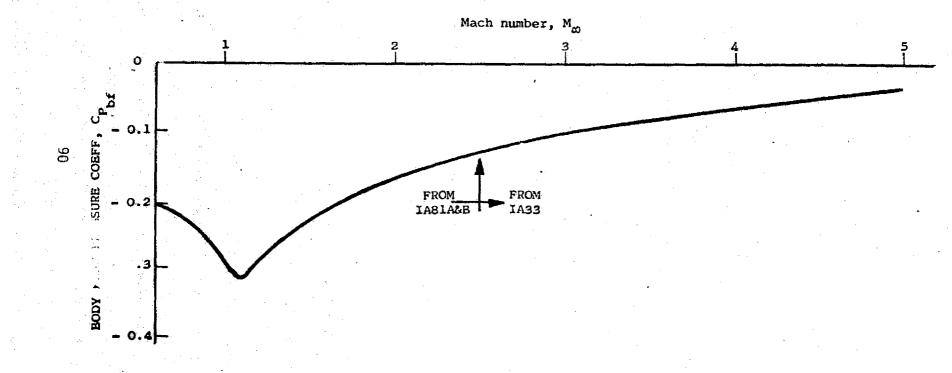
Manifold tubes as follows:

 Definition of Base Pressure Tube Locations, Balance in Tank (Forked Sting)
 Figure 2. - Continued.

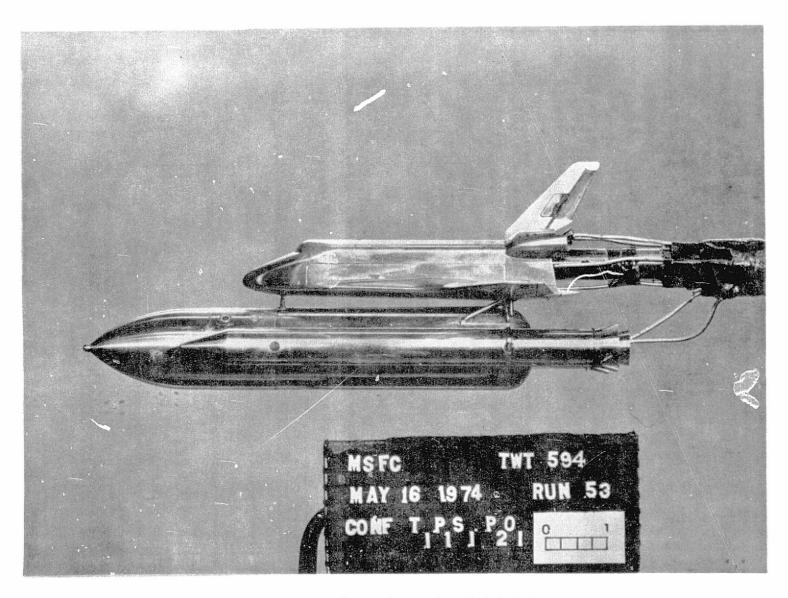
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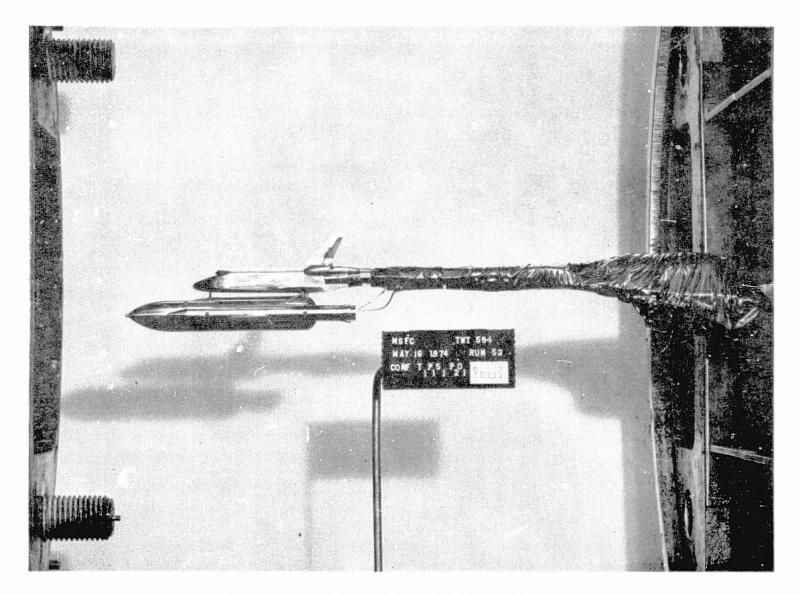
m. Base Pressure Coefficient Increment Due to Difference Between Pressure Taps and Rake Figure 2. - Continued.



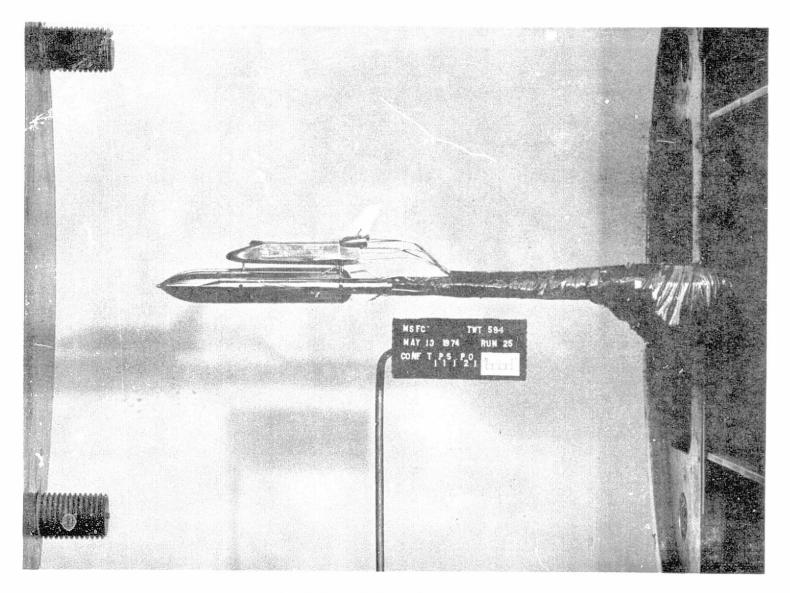
n. Orbiter Body Flap Pressure Coefficients Figure 2. - Concluded.



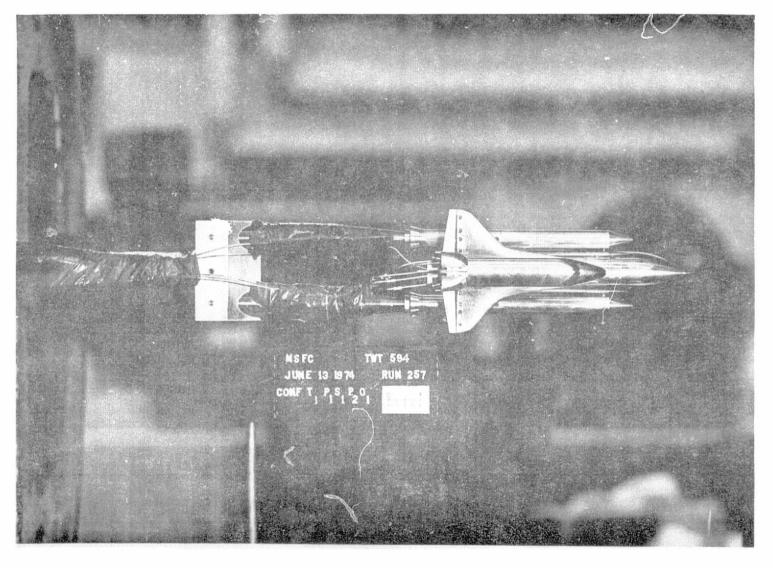
a. Photograph of Configuration T<sub>1</sub>P<sub>1</sub>S<sub>1</sub>P<sub>2</sub>O<sub>1</sub>Figure 3. - Model Photographs.



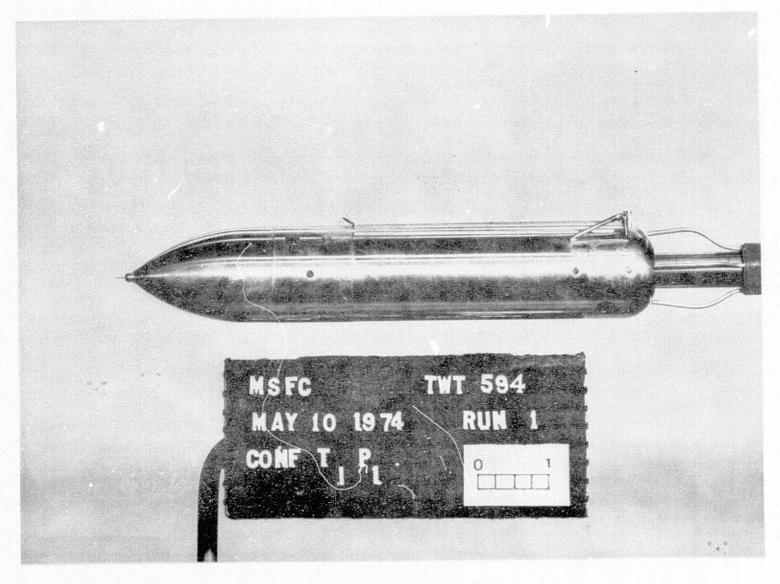
 Photograph of Tunnel Installation of Launch Vehicle Model (Balance In Orbiter) Figure 3. - Continued.



 Photograph of Tunnel Installation of Launch Vehicle Model (Balance In Tank)
 Figure 3. - Continued.



 d. Photograph of Tunnel Installation of Launch Vehicle Model (Balance In Tank, Forked Sting) Figure 3. - Continued.



e. Photograph of Configuration  $T_1P_1$  Figure 3. - Concluded.

#### DATA FIGURES

Volume 1 - Figures 4-12 Volume 2 - Figures 13-26

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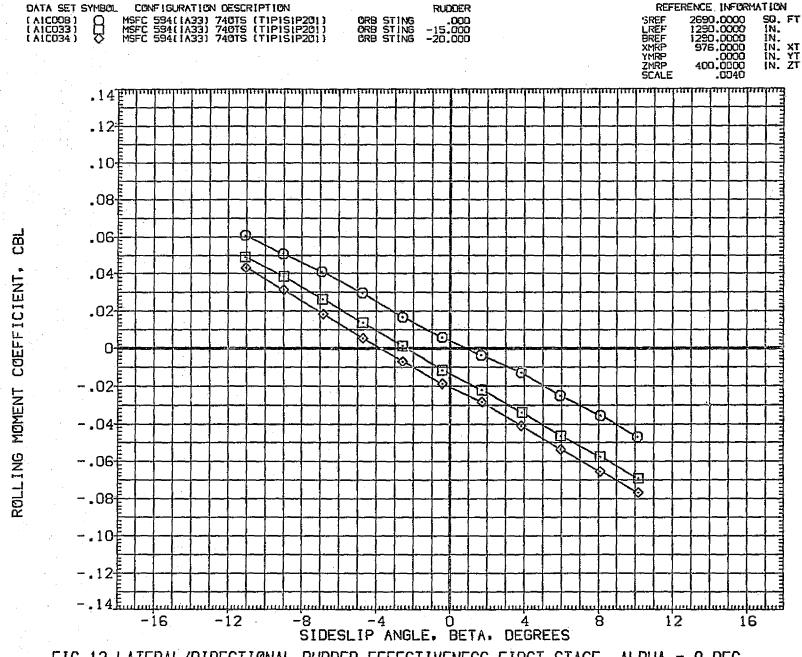
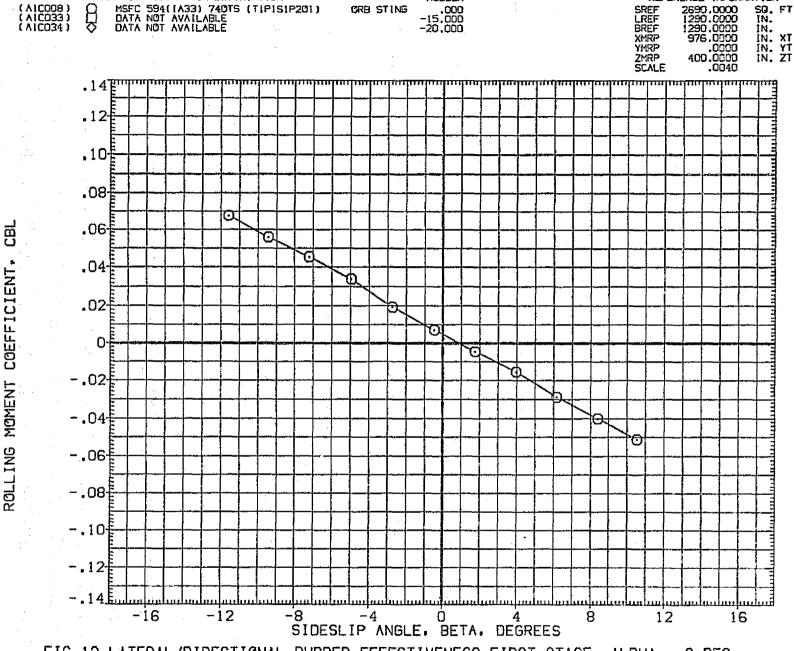


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(A)MACH = .60

PAGE 745



RUDDER

REFERENCE INFORMATION

DATA SET SYMBOL CONFIGURATION DESCRIPTION

FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(B)MACH = .80

PAGE 746

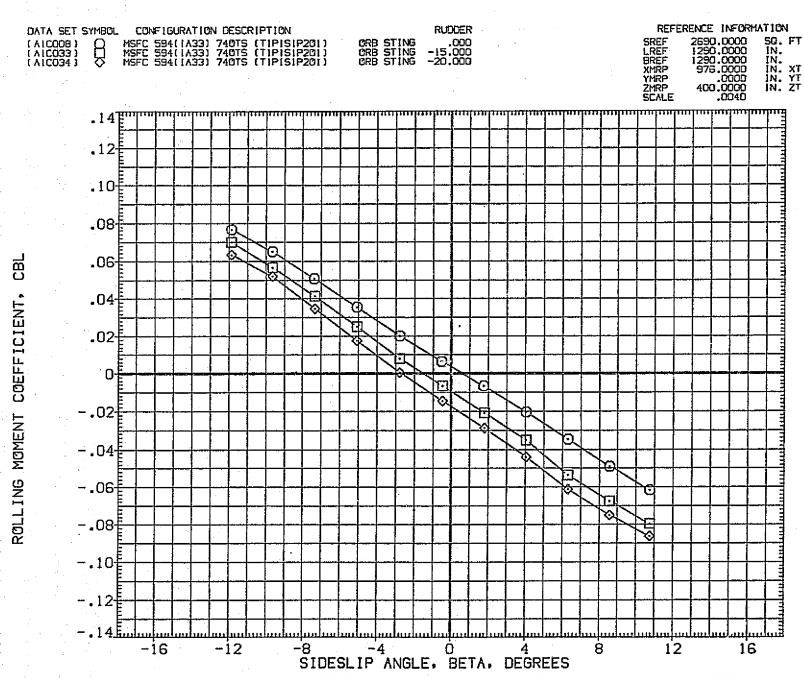


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

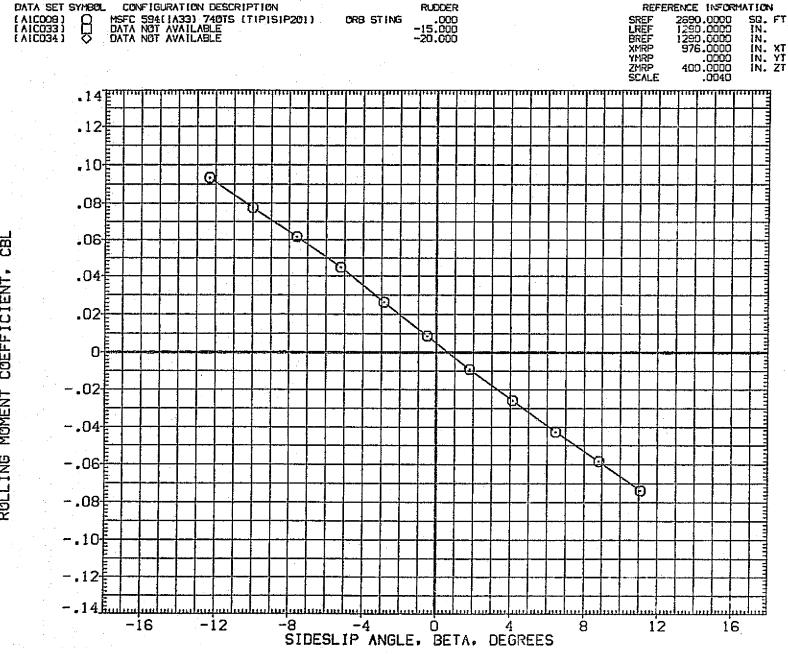


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(D)MACH = 1.05

PAGE

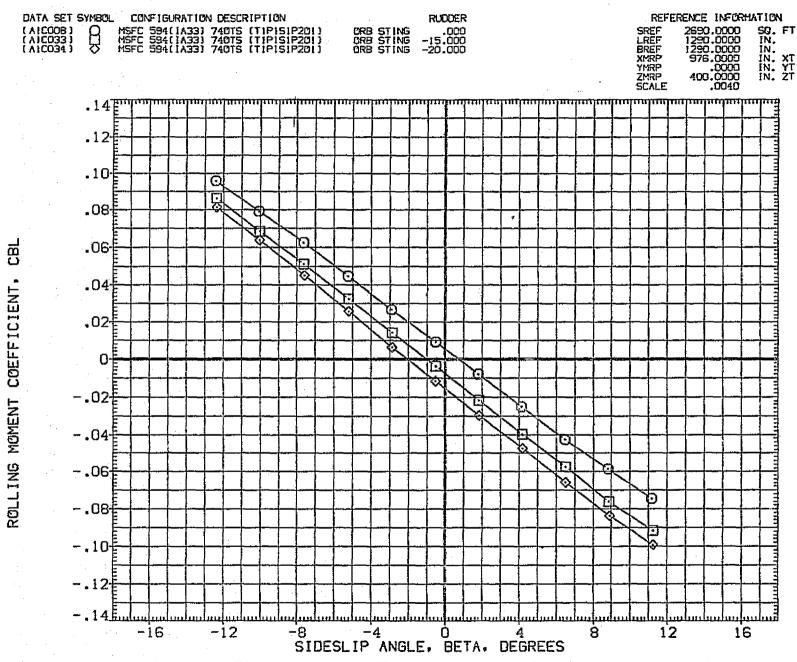
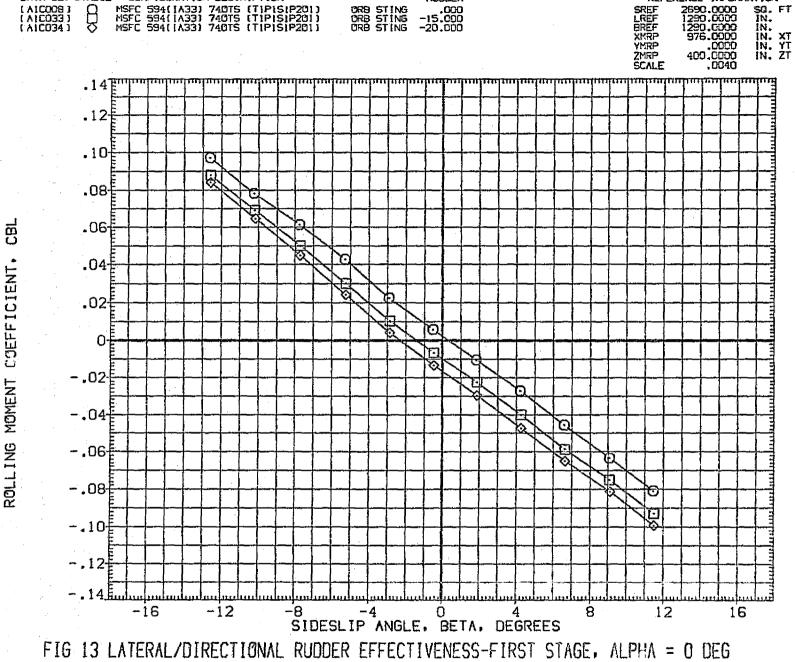


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(E)MACH = 1.10

PAGE 749



RUDDER

REFERENCE INFORMATION

DATA SET SYMBOL CONFIGURATION DESCRIPTION

(F)MACH = 1.25PAGE 750

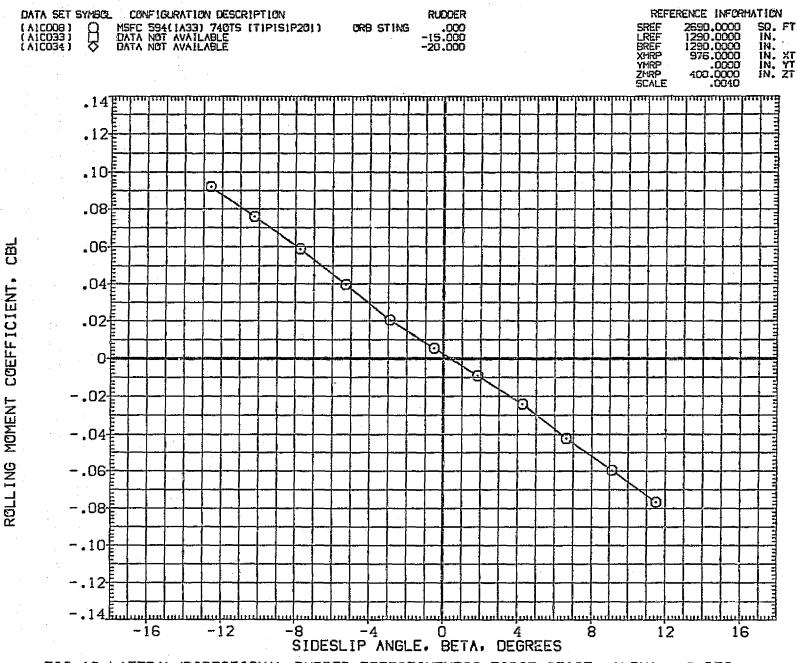


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(G)MACH = 1.47

PAGE 751

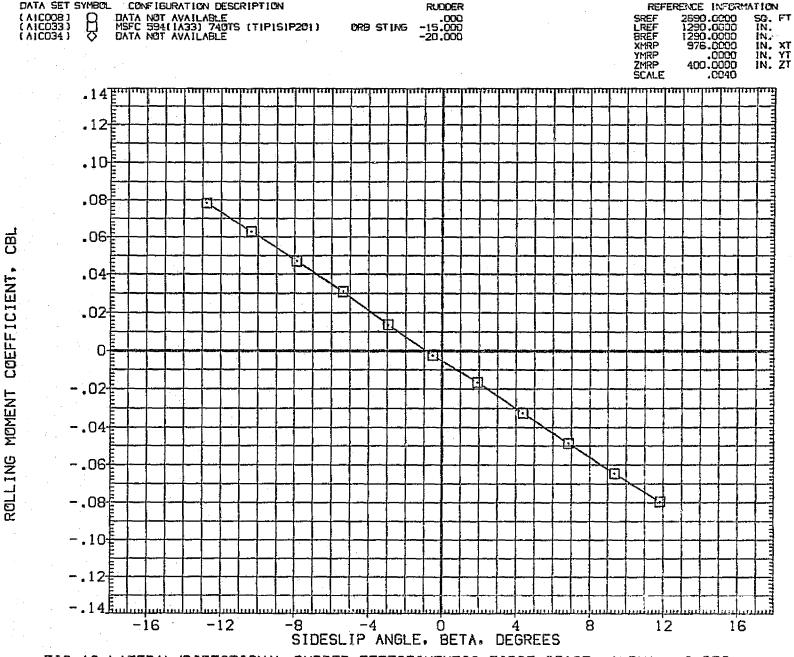


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG
(H)MACH = 1.94
PAGE 752

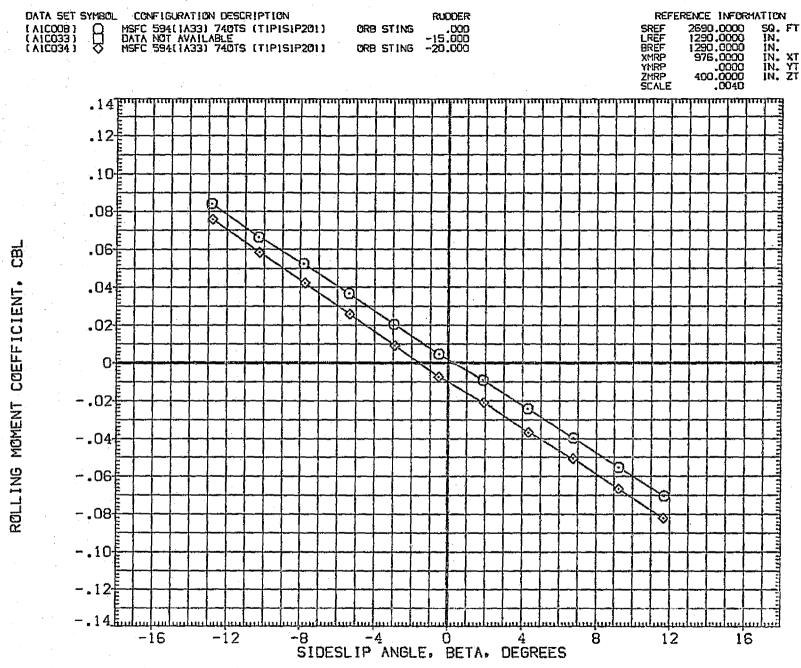


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG
(I)MACH = 1.97

PAGE 753

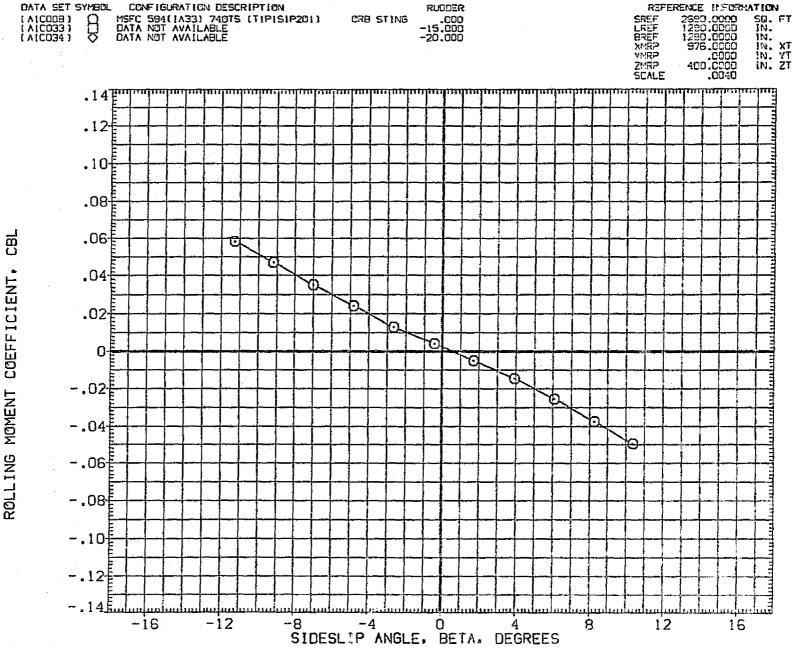


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

[JDMACH = 2.99 PAGE 754]



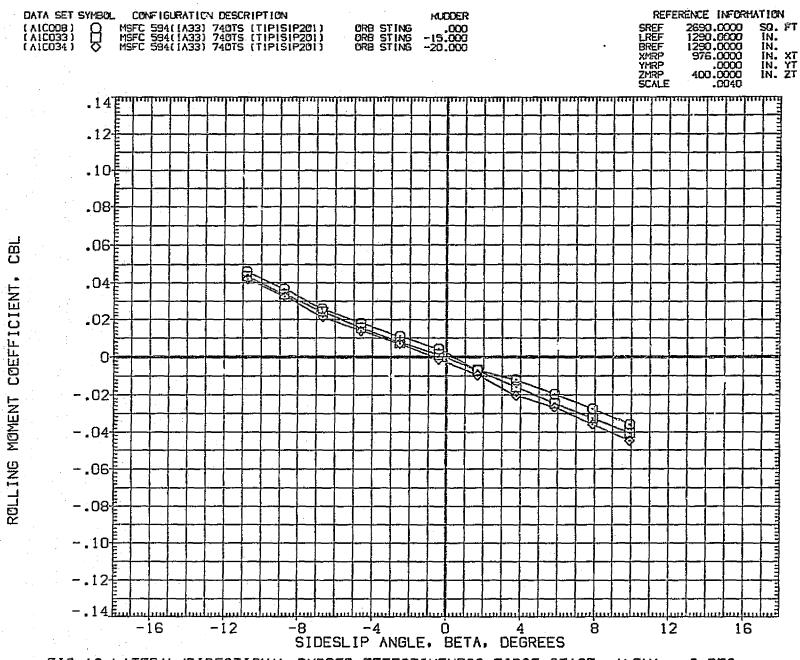


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(K)MACH = 4.96

PAGE 755

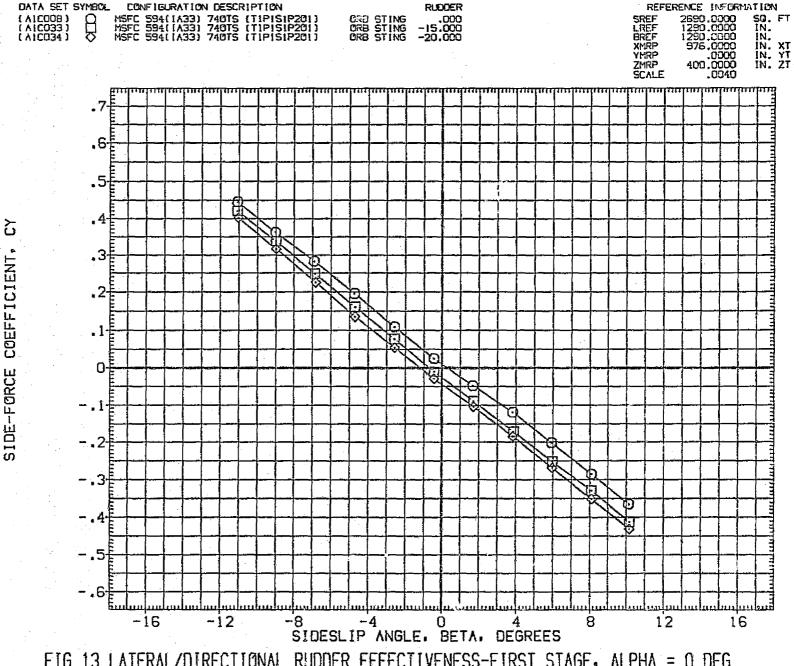


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(A)MACH = .60

PAGE 756

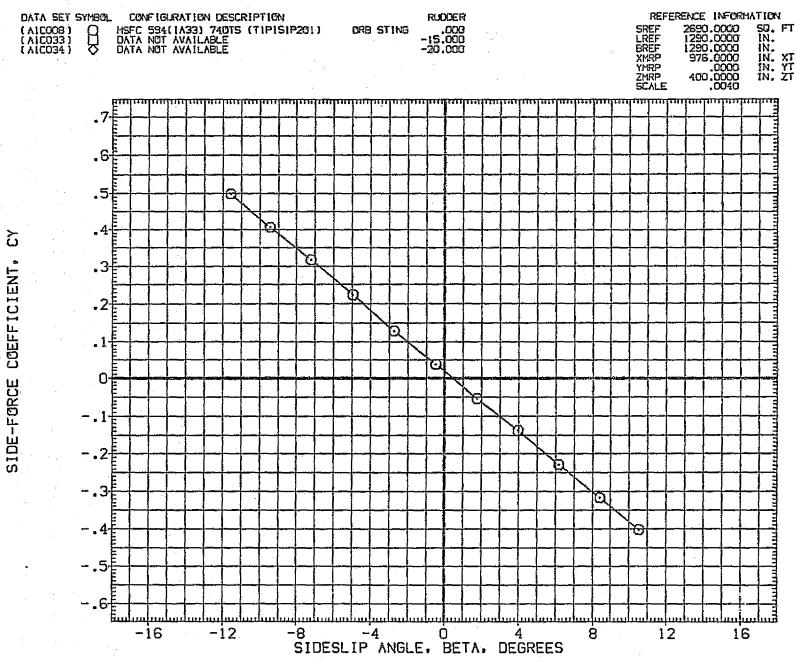
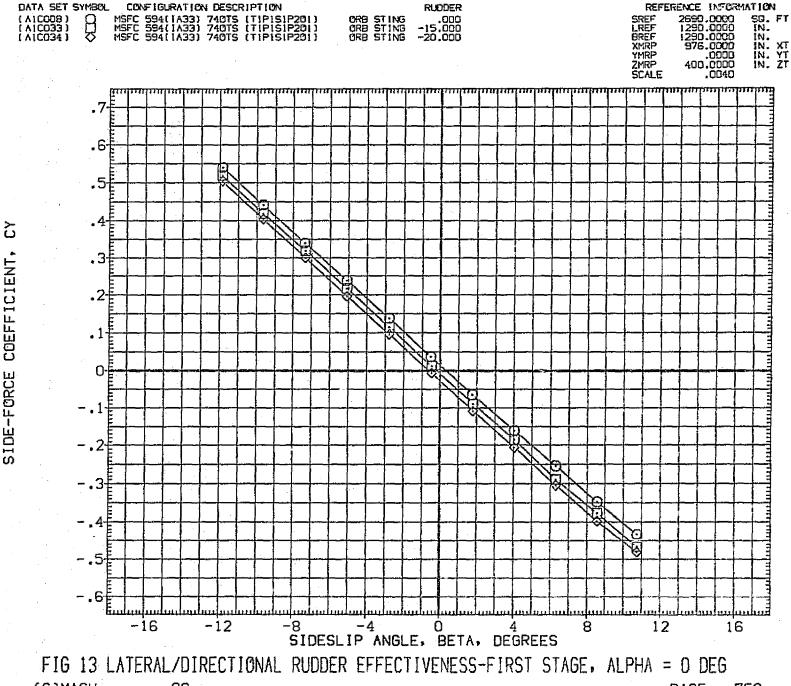


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(B)MACH = .80

PAGE 757



(C)MACH = .90PAGE 758

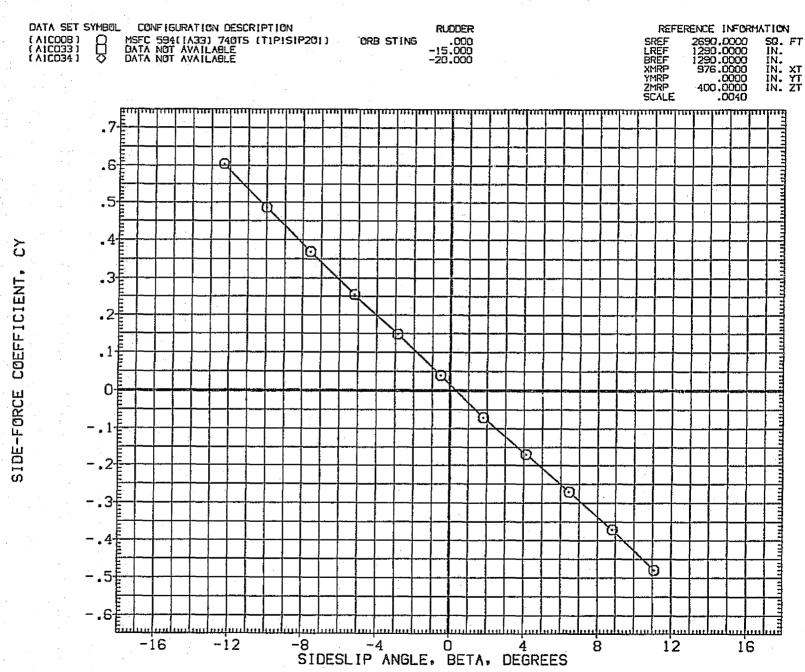
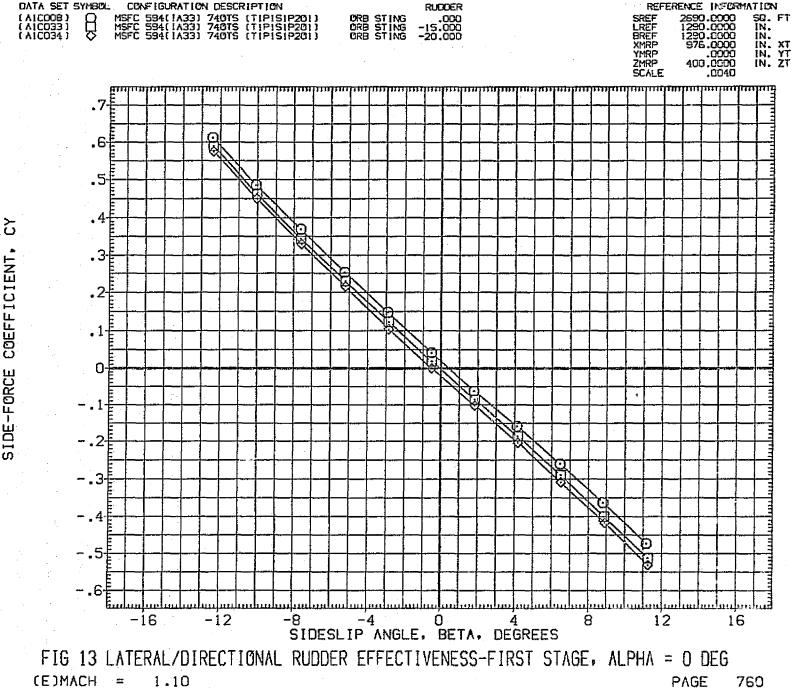


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE. ALPHA = 0 DEG

(D)MACH = 1.05

PAGE

759



PAGE

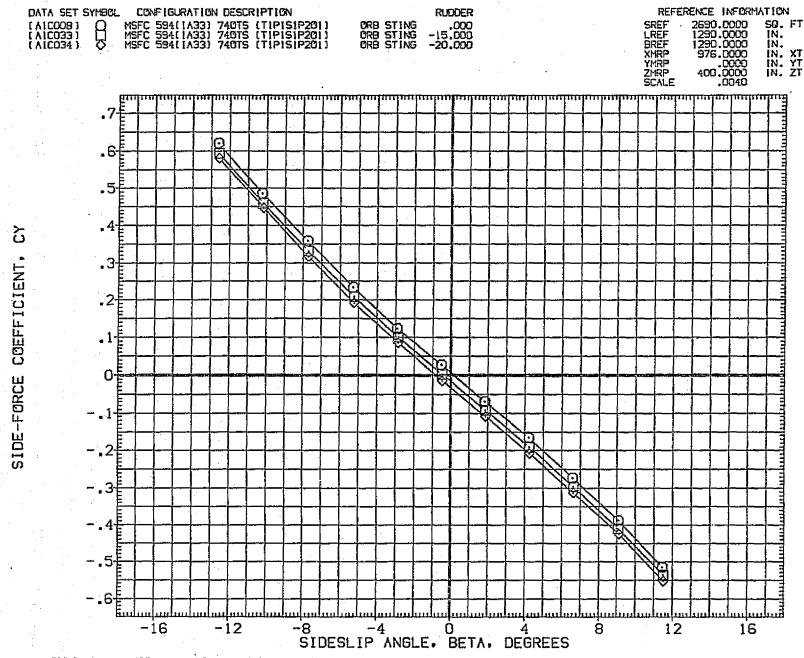
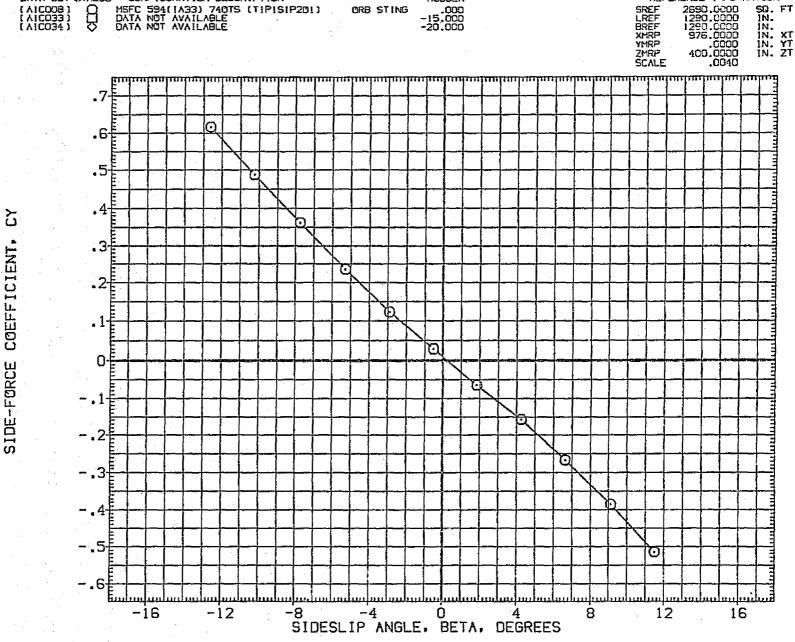


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(F)MACH = 1.25

PAGE 761



RUDDER

REFERENCE INFORMATION

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FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE. ALPHA = 0 DEG

(G)MACH = 1.47

PAGE 762

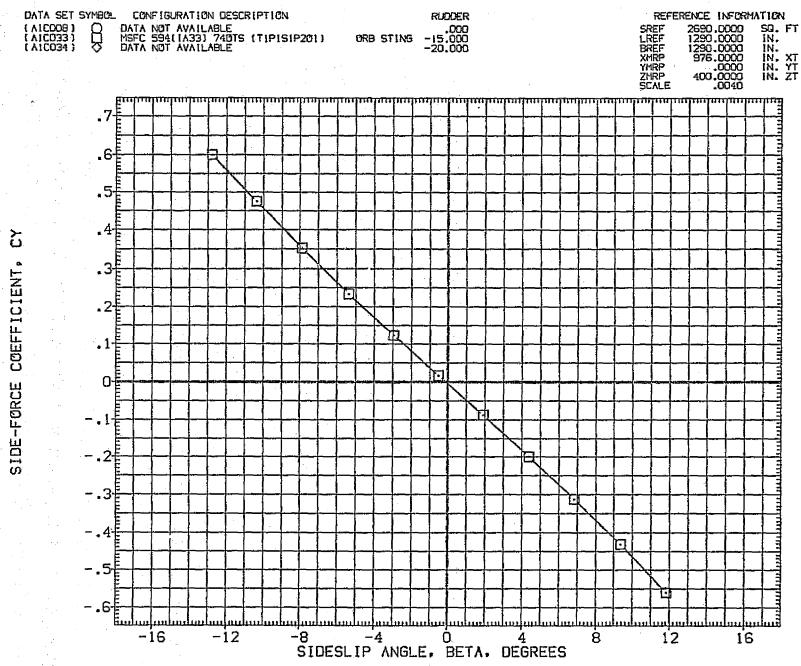


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

CHOMACH = 1.94

PAGE 763

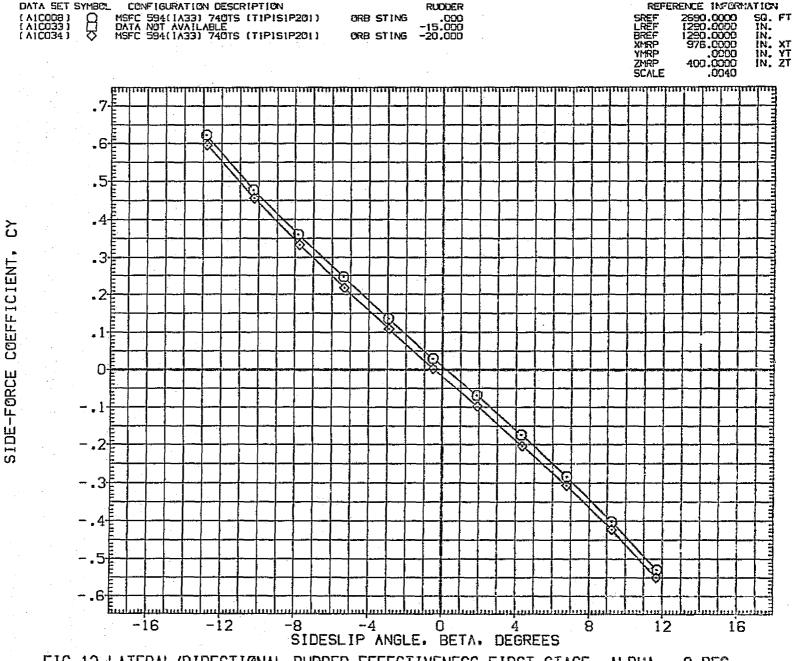


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(I)MACH = 1.97

PAGE 784

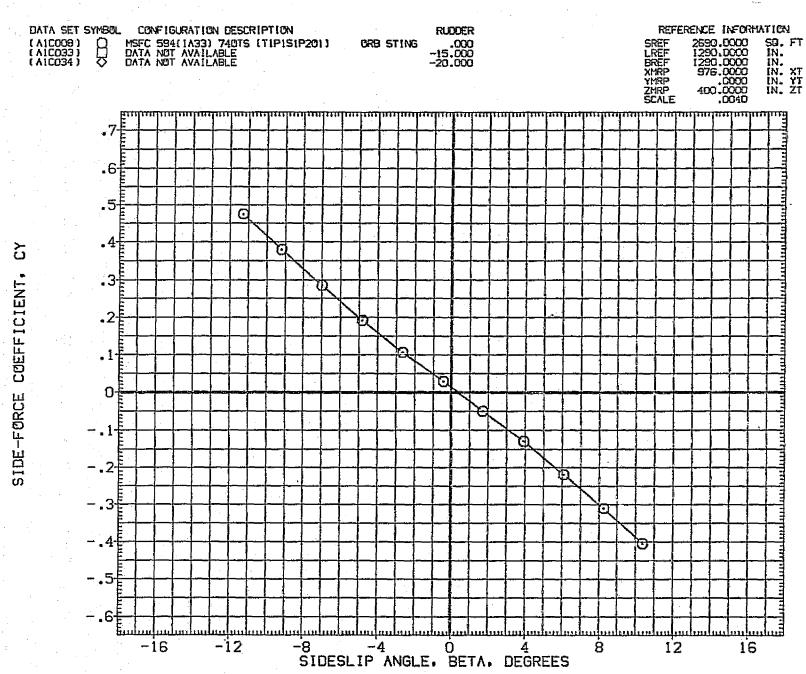
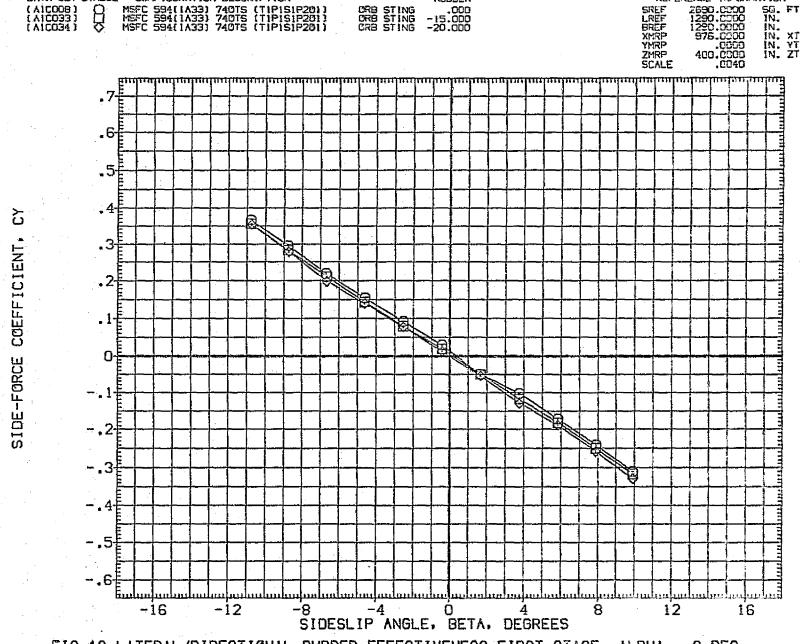


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG (J)MACH = 2.99 PAGE

765



DATA SET SYMBOL CONFIGURATION DESCRIPTION

FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(K)MACH = 4.96

PAGE 766

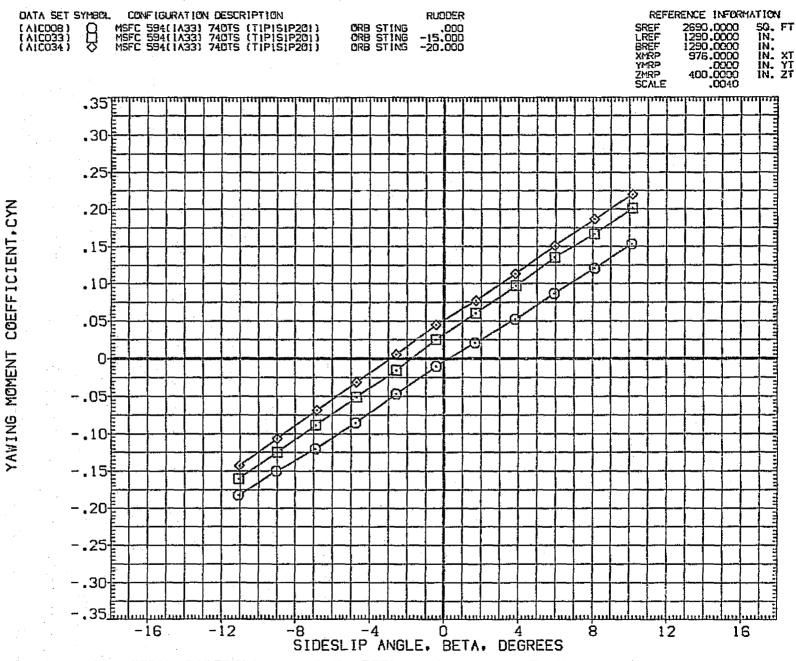
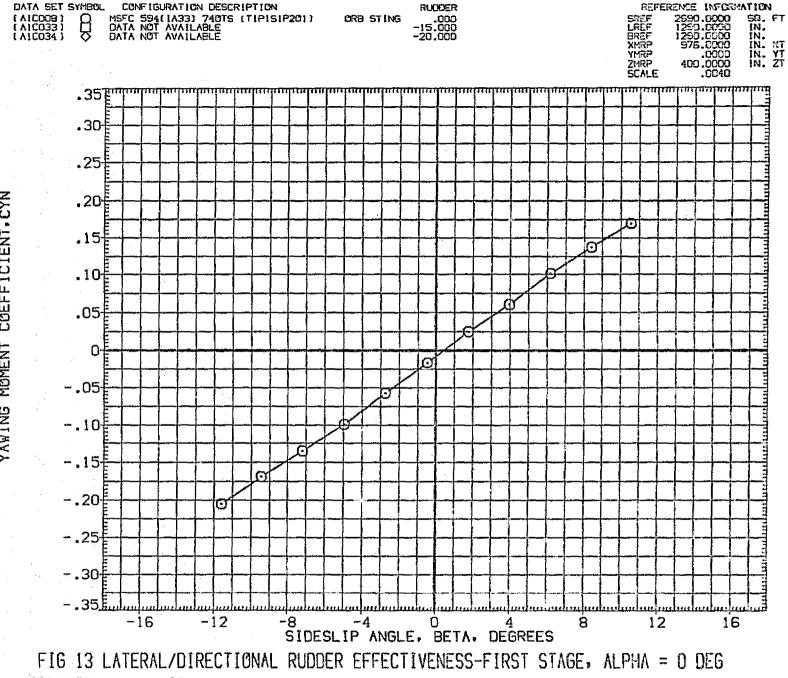


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(A)MACH = .60

PAGE 767



(B)MACH = .80 PAGE 768

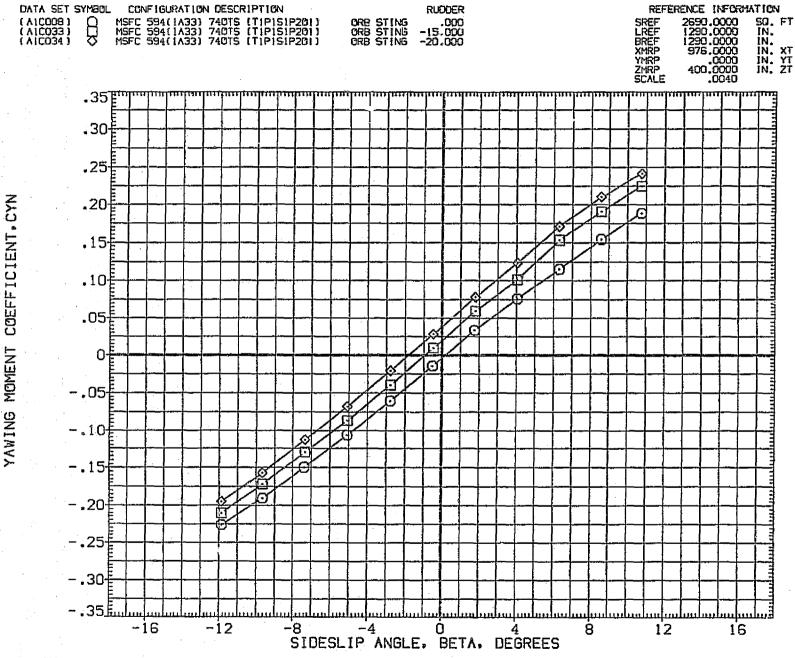
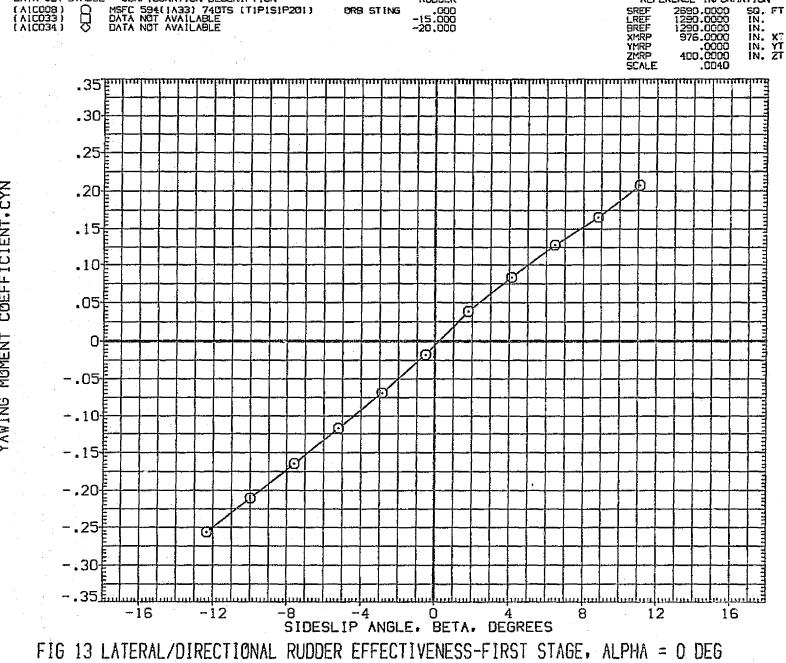


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(C)MACH = .90

PAGE 769



ORB STING

REFERENCE INFORMATION

CONFIGURATION DESCRIPTION

(D)MACH = 1.05 PAGE 770

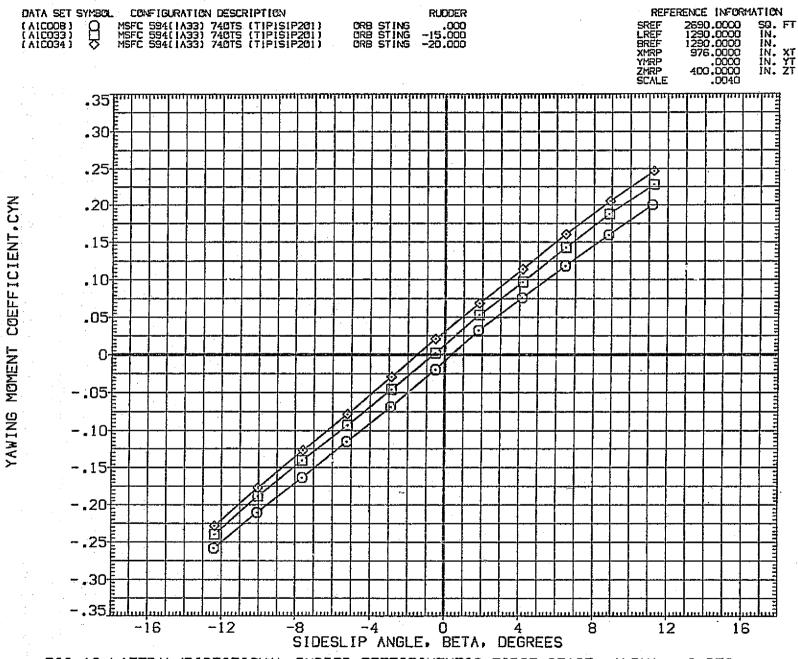
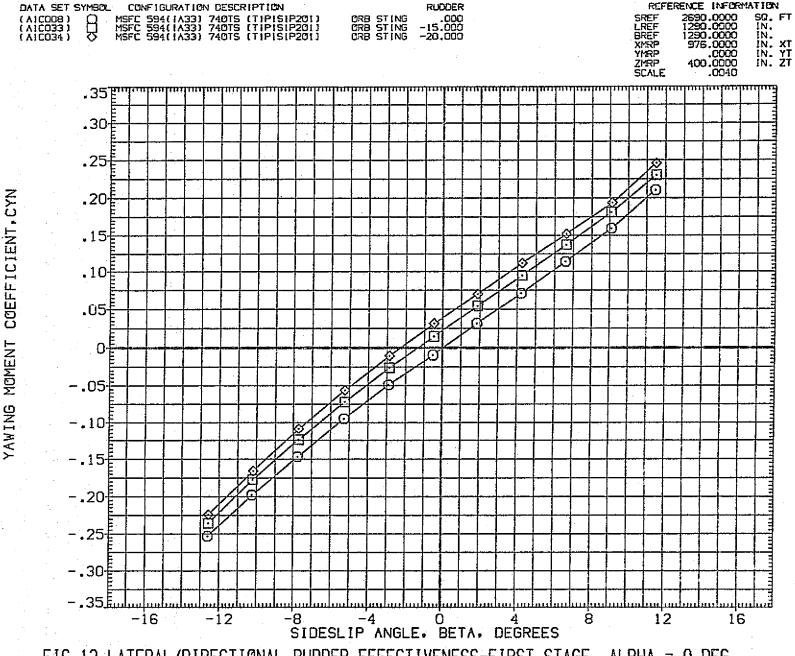


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG
(E)MACH = 1.10

PAGE 771



REFERENCE INFORMATION

FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE. ALPHA = 0 DEG (F)MACH = 1.25PAGE 772

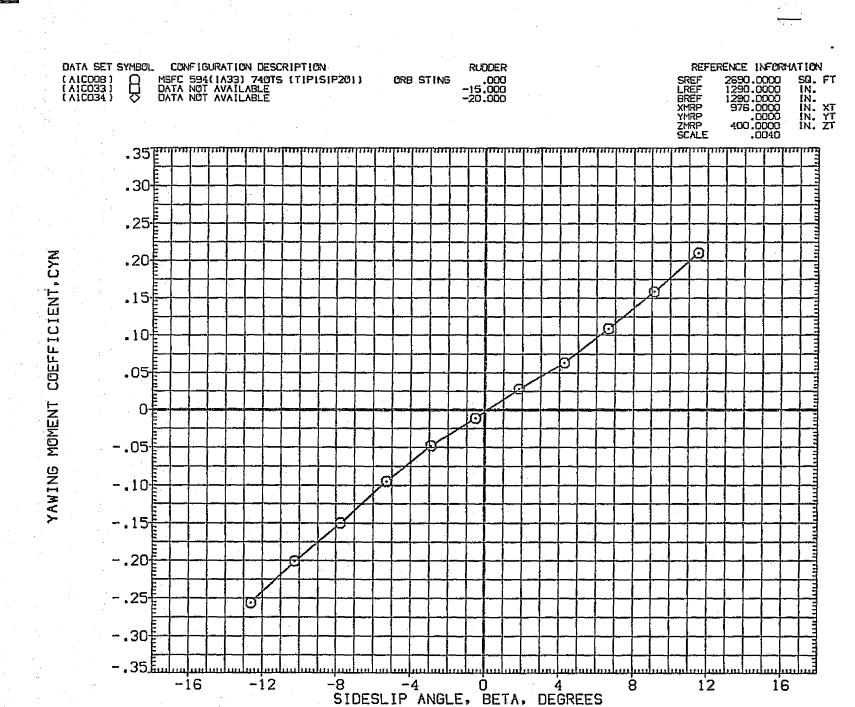


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(G)MACH = 1.47

PAGE 773

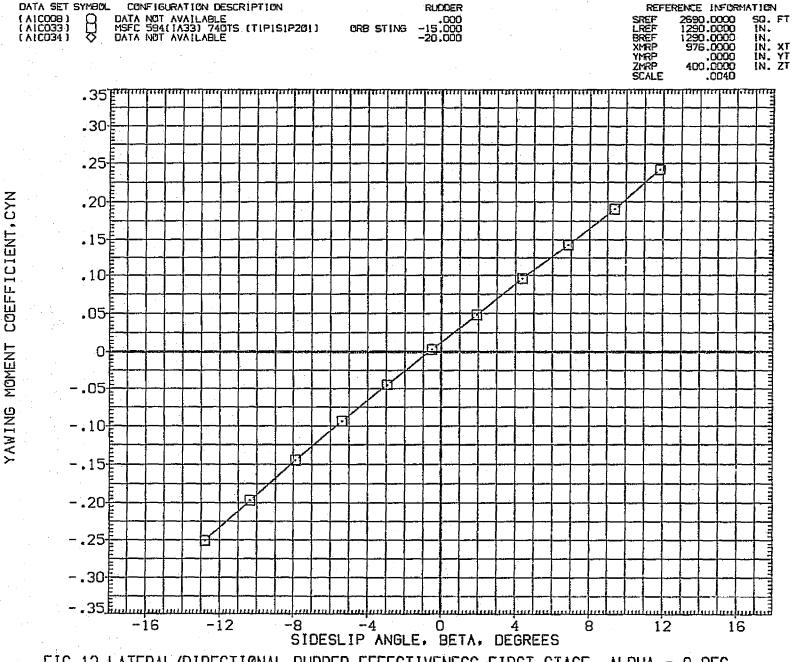


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

CHOMACH = 1.94

PAGE 774

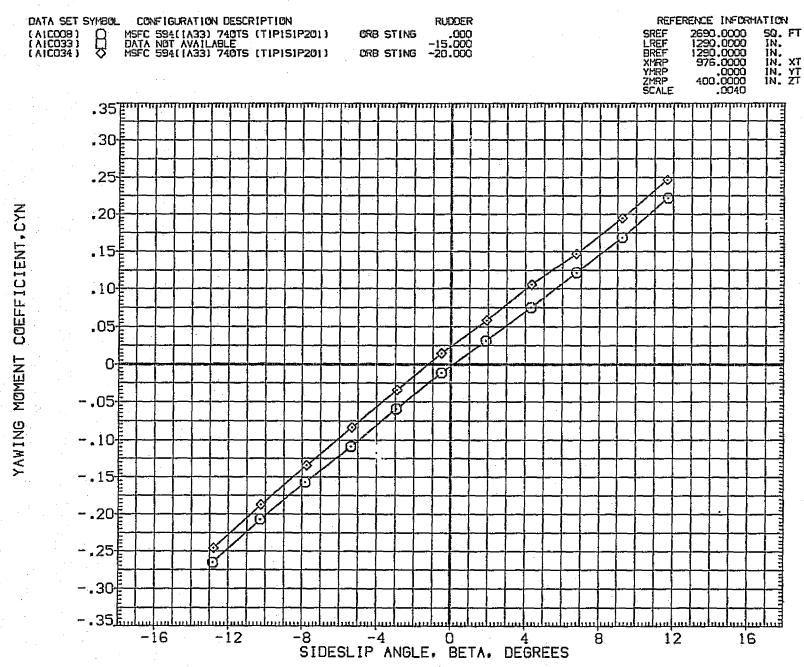


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(I)MACH = 1.97

PAGE 775

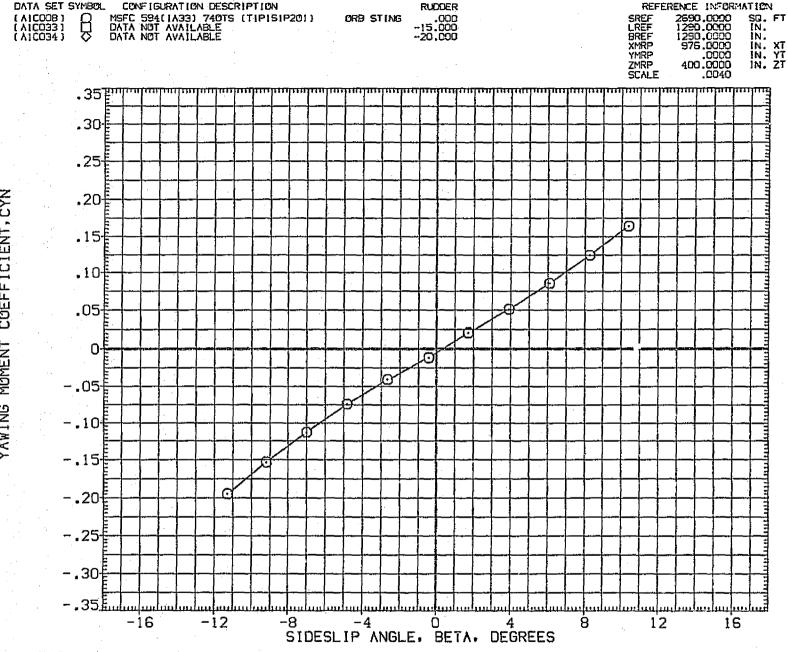


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE. ALPHA = 0 DEG

CJ)MACH = 2.99

PAGE 776

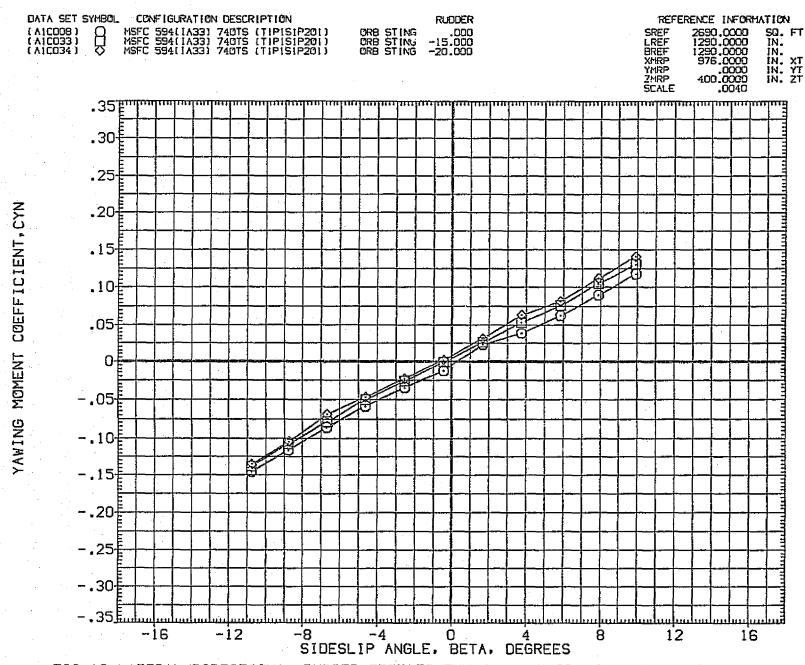
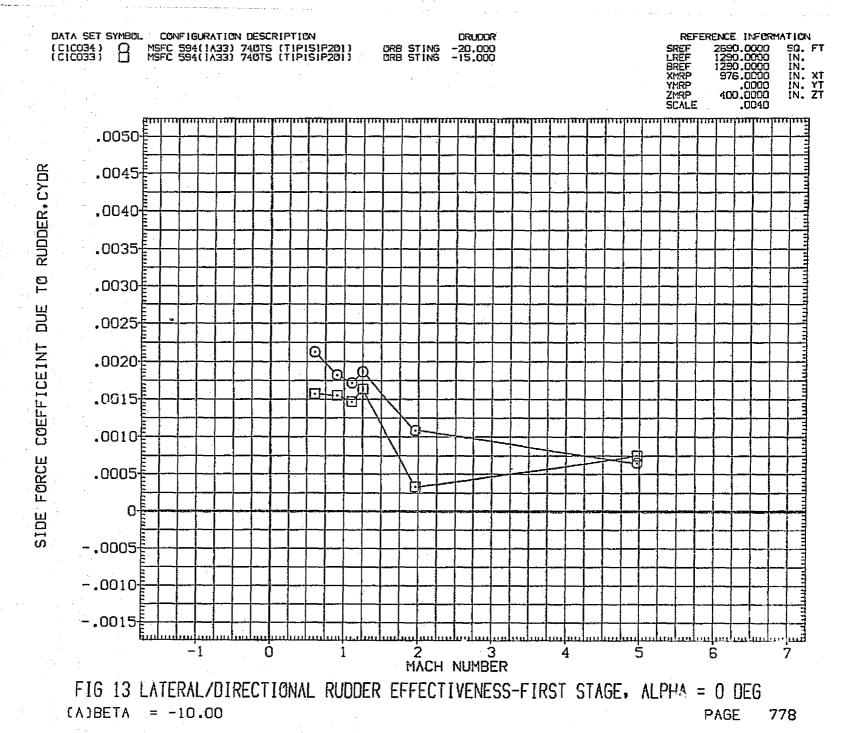


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE. ALPHA = 0 DEG

(K)MACH = 4.96

PAGE 777



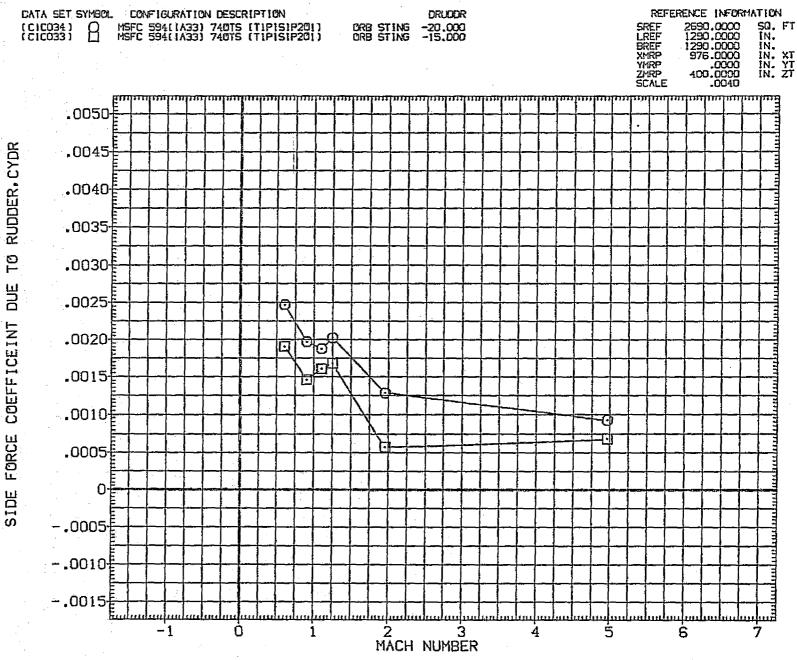


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(B)BETA = -8.00

PAGE 779

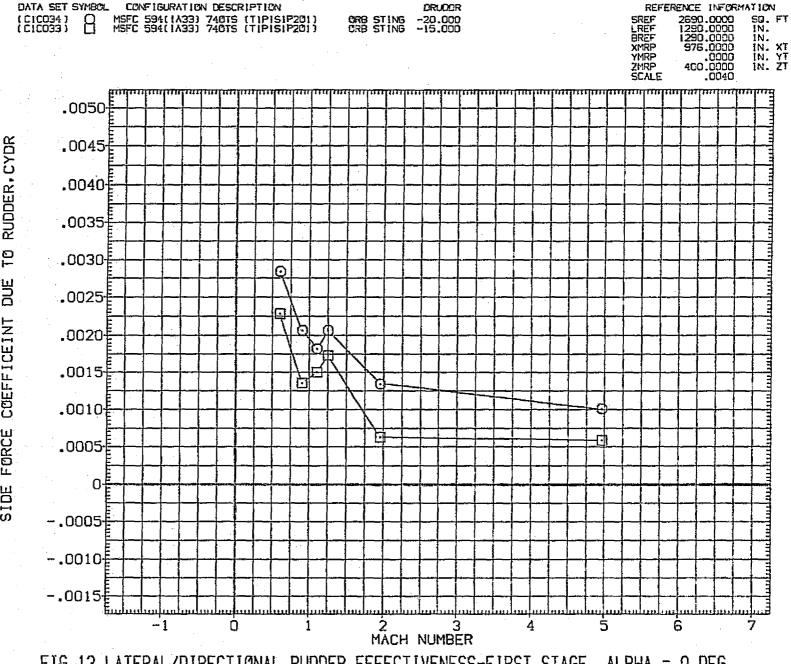


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG (C)BETA = -6.00 PAGE 780

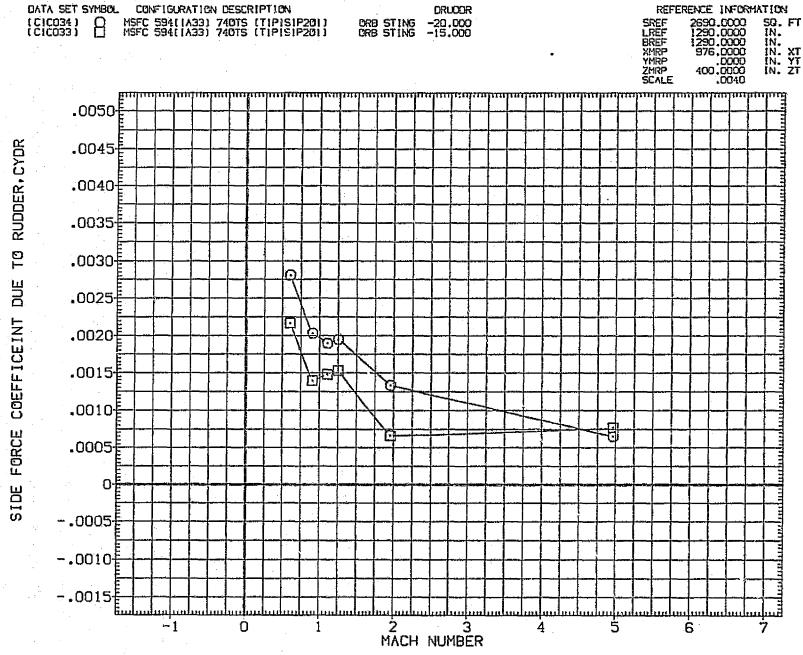


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

CD3BETA = -4.00

PAGE 781

FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(E)BETA = -2.00

PAGE 782

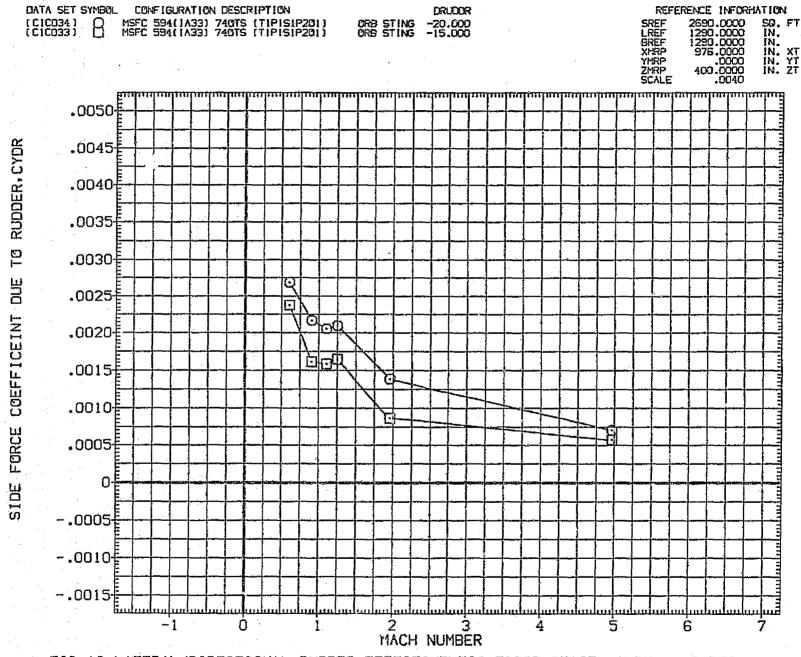
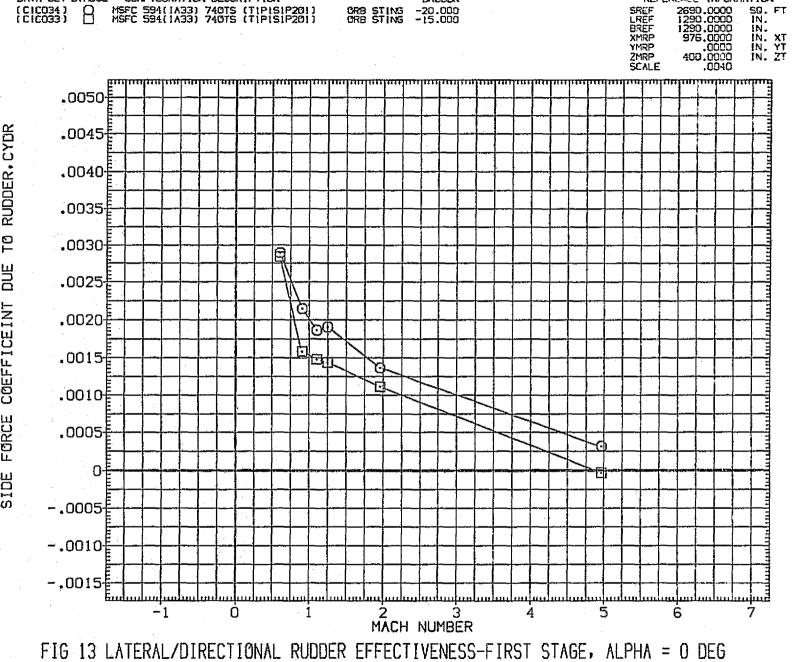


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(F)BETA = .00

PAGE 783

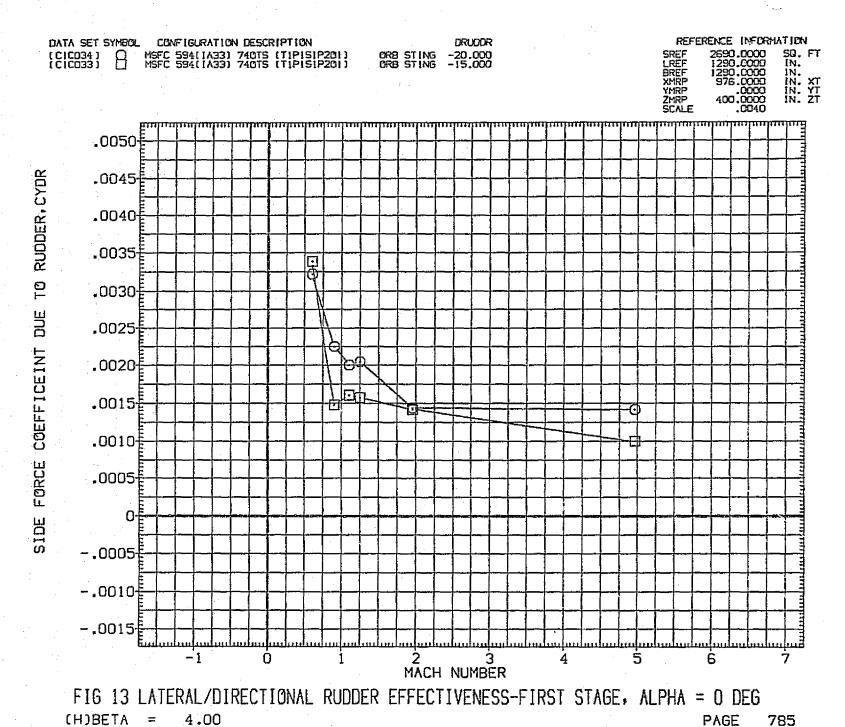


DATA SET SYMBOL CONFIGURATION DESCRIPTION

FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(G)BETA = 2.00 PAGE 784







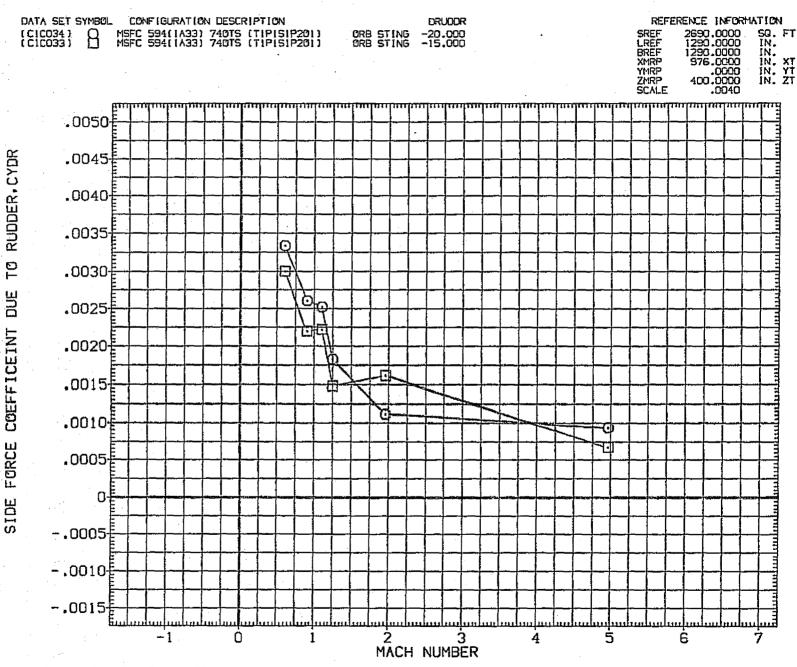


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(J)BETA = 8.00

PAGE 787

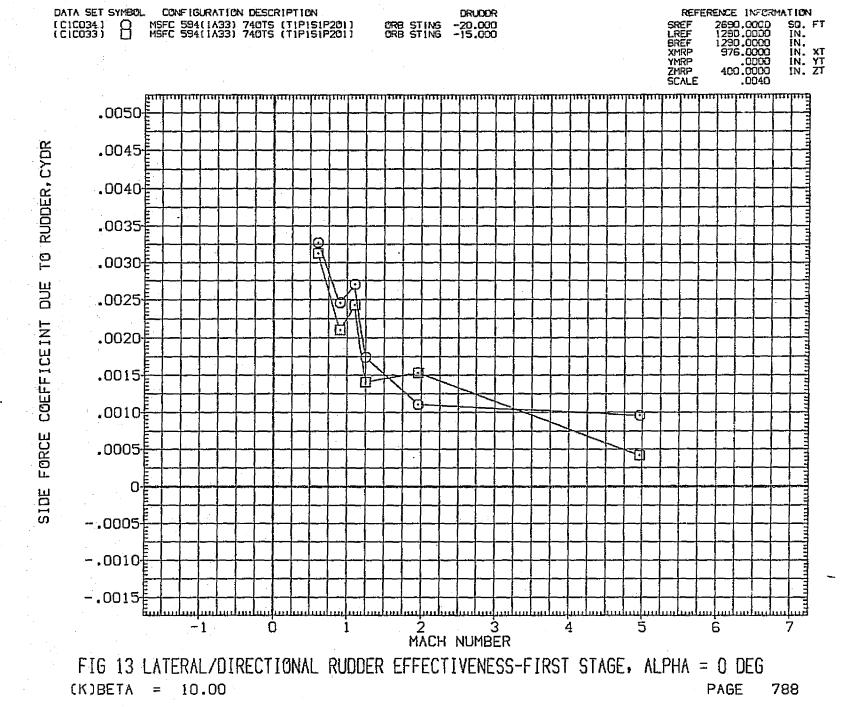


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

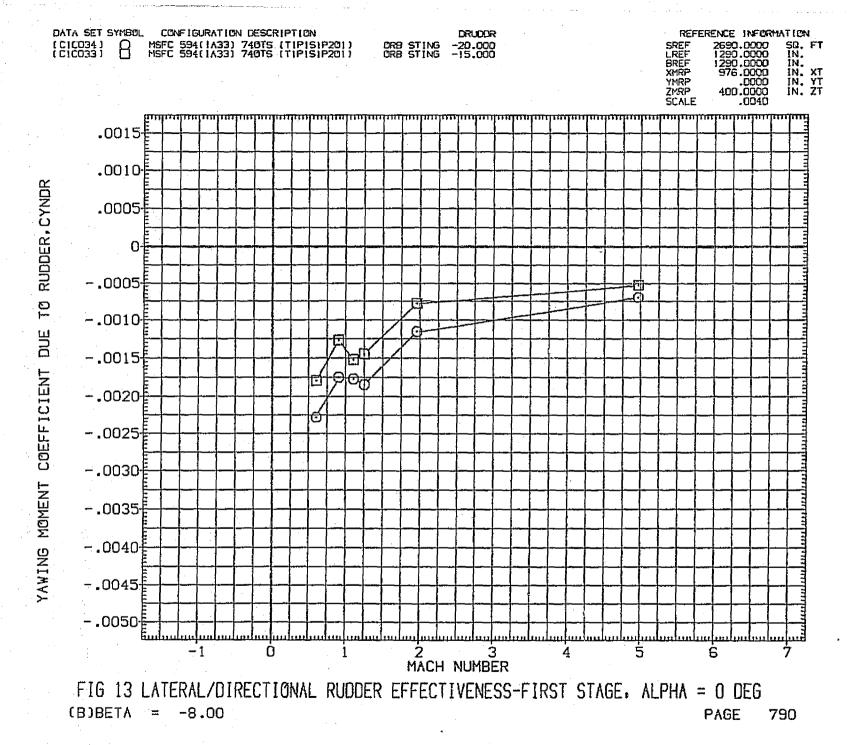
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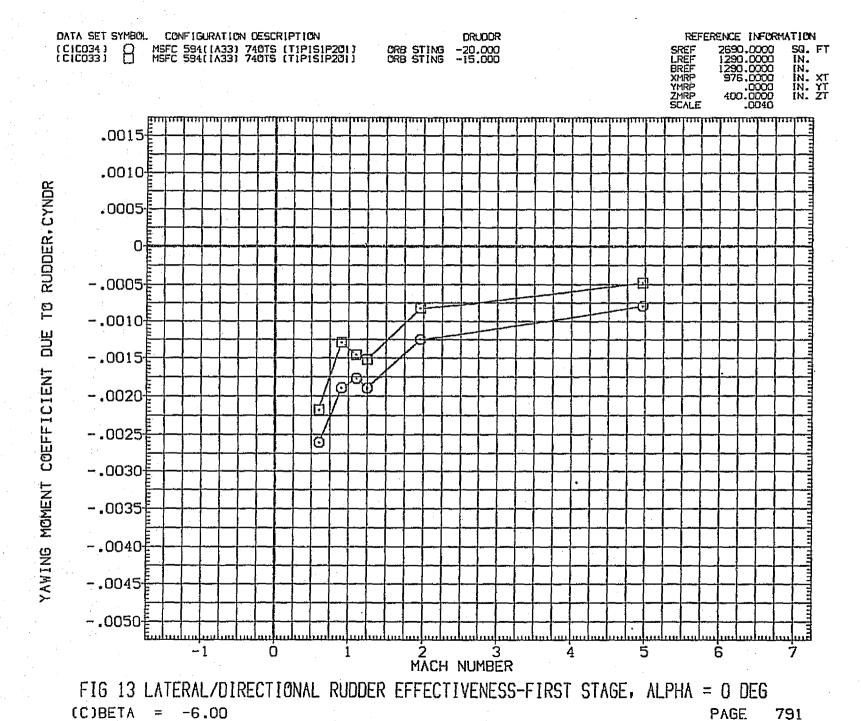
PAGE 789

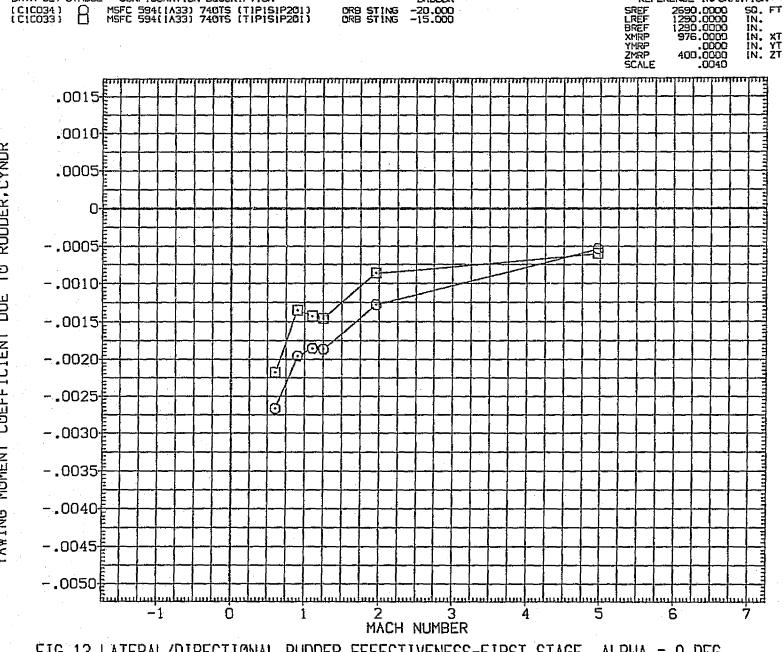
MACH NUMBER

Š.

Ò







DRUDDR

FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(D)BETA = -4.00

PAGE 792

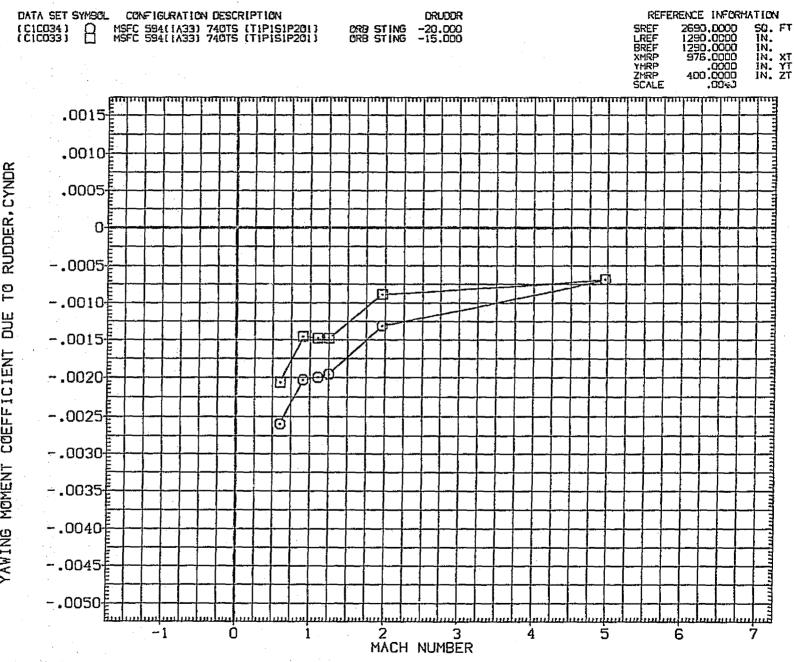


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG
(E)BETA = -2.00
PAGE 793

REFERENCE INFORMATION

DATA SET SYMBOL

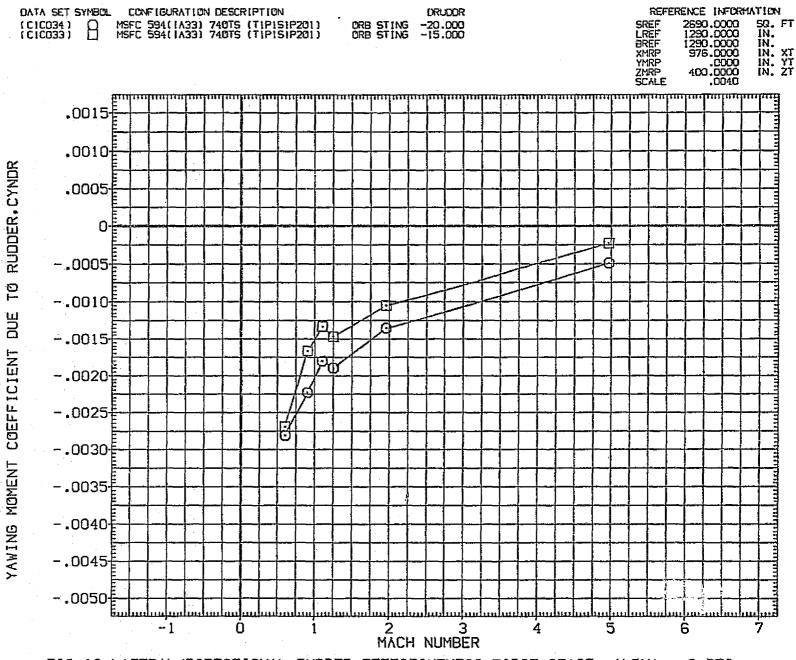


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

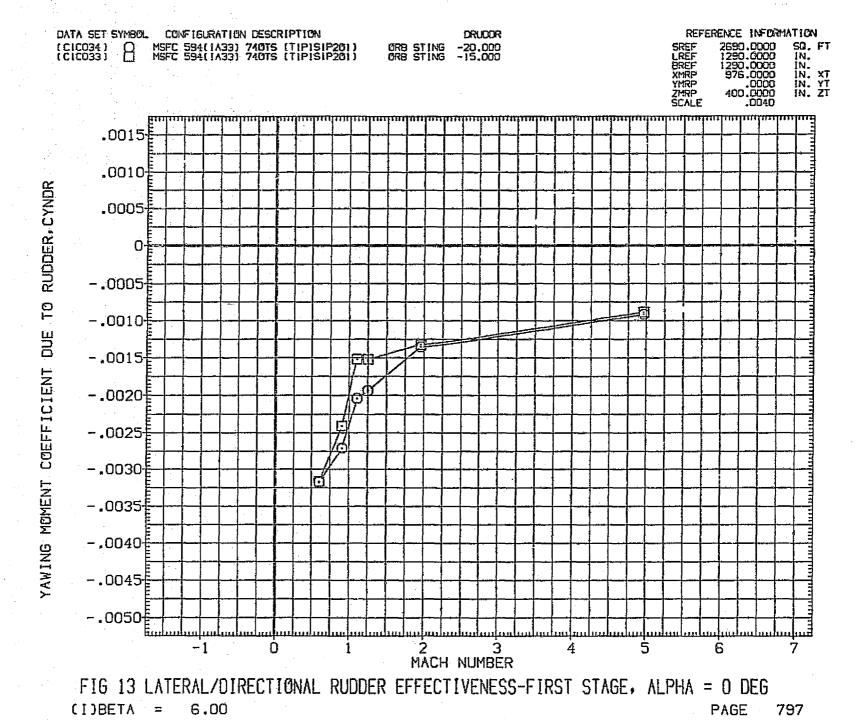
(G)BETA = 2.00 PAGE 795

DATA SET SYMBOL CONFIGURATION DESCRIPTION

REFERENCE INFORMATION

(H)BETA = 4.00 PAGE 796





REFERENCE INFORMATION

PAGE

798

DATA SET SYMBOL CONFIGURATION DESCRIPTION

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8.00

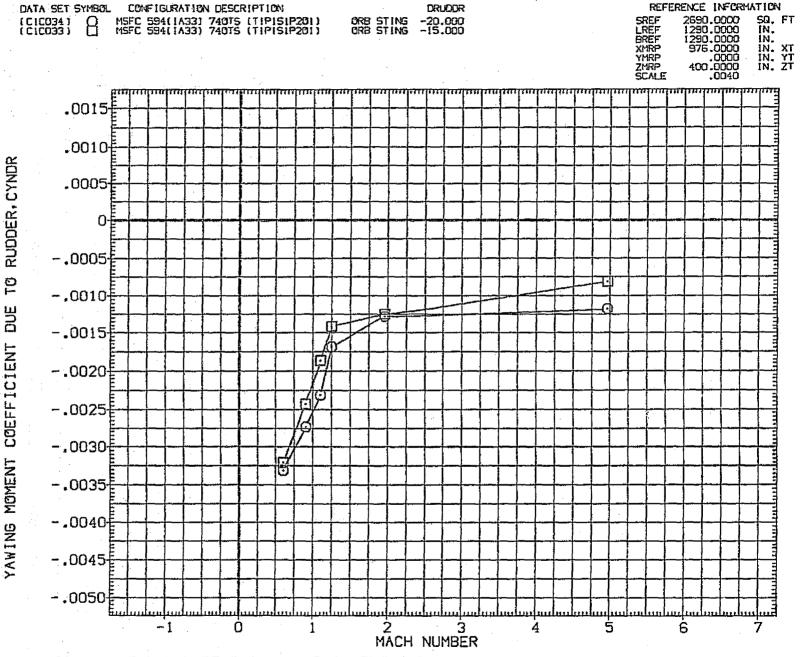


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(K)BETA = 10.00

PAGE 799

FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE. ALPHA = 0 DEG

(A)BETA = -10.00

PAGE 800

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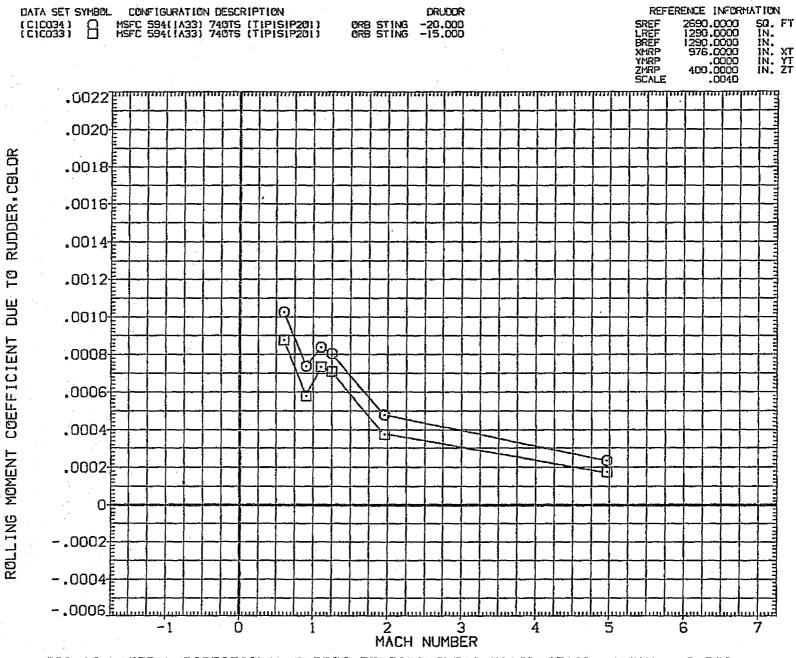
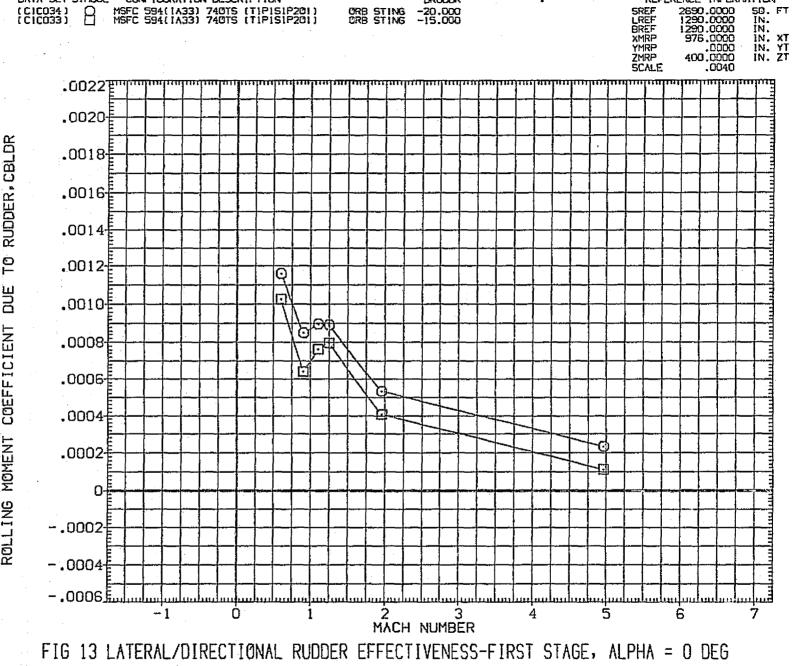


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(B)BETA = -8.00

PAGE 801



DATA SET SYMBOL

(C)BETA = -6.00PAGE 802



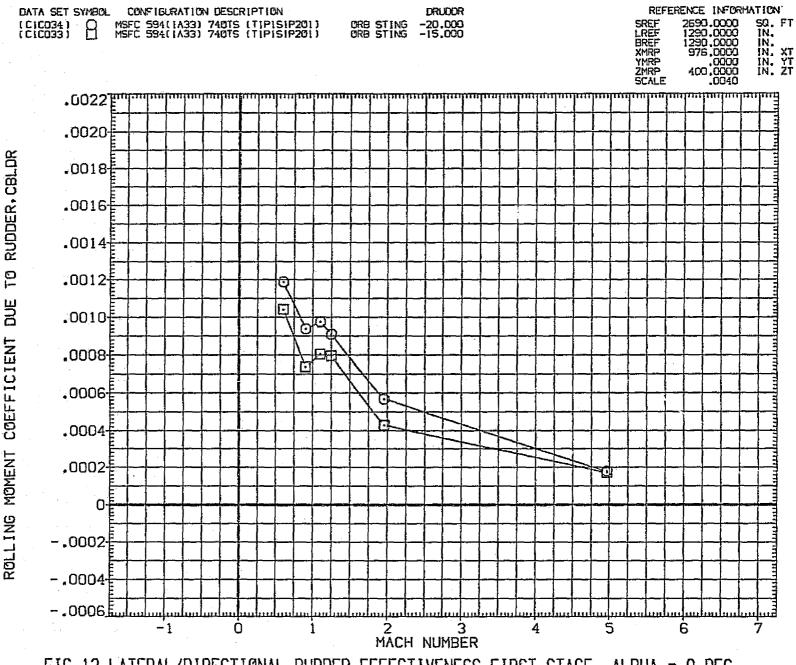


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(D)BETA = -4.00

PAGE 803

DRUDOR

REFERENCE INFORMATION



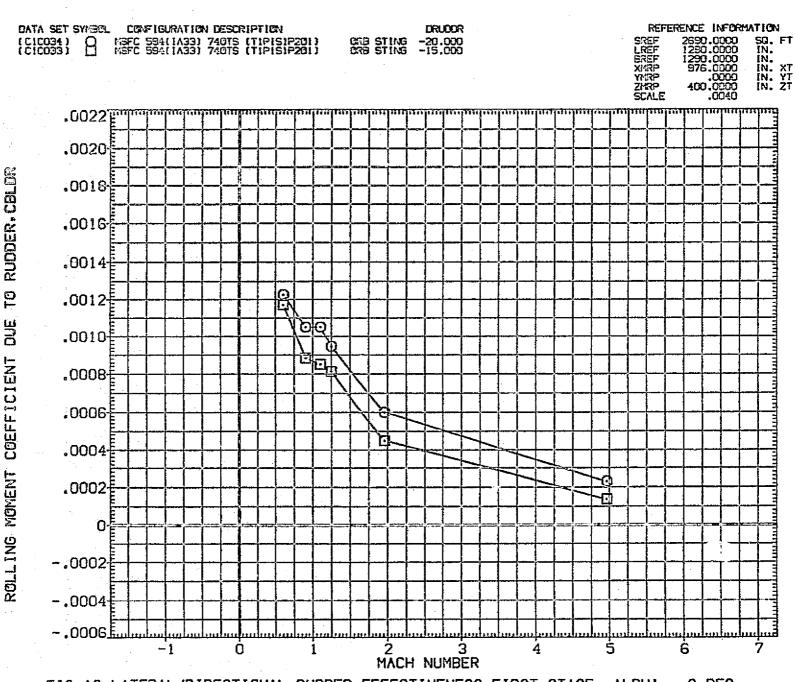


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(F)BETA = .00

PAGE

805

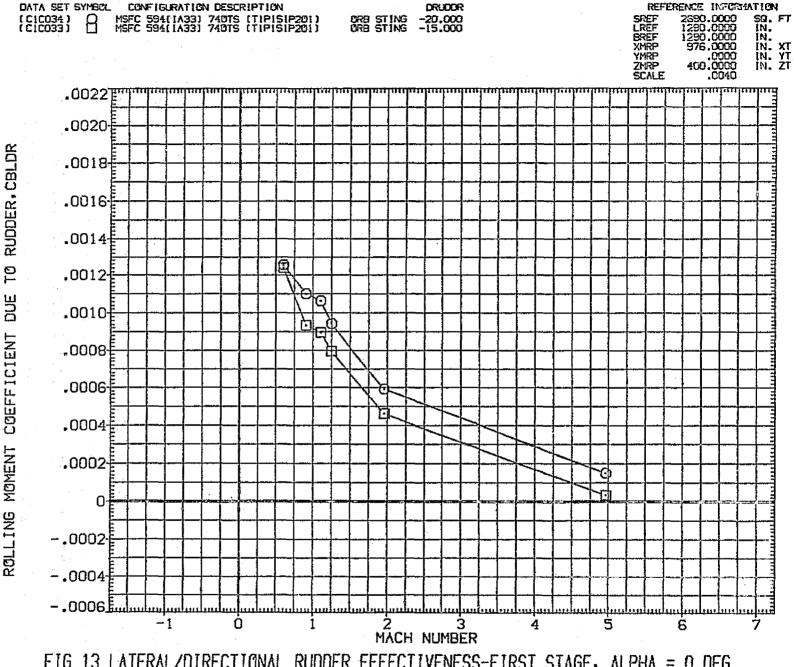


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(G)BETA = 2.00

PAGE 806

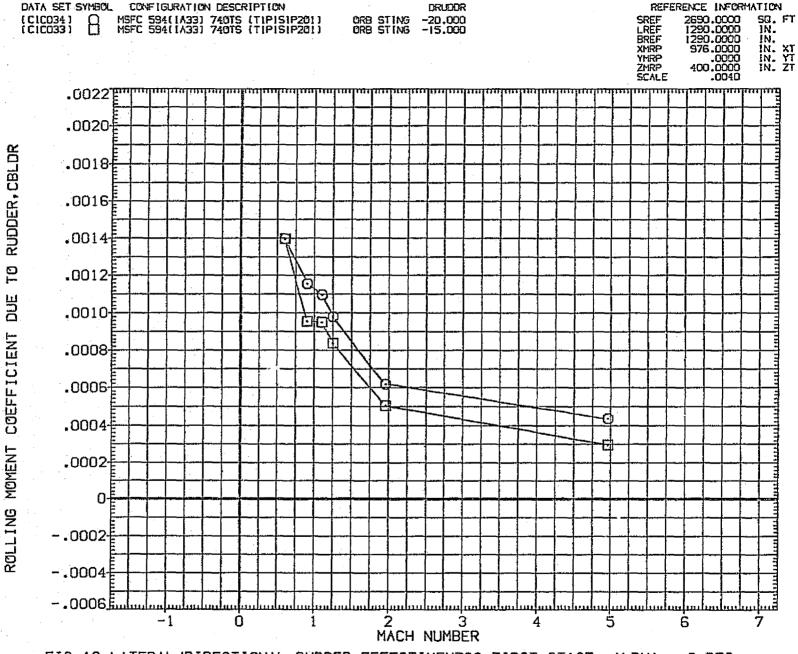
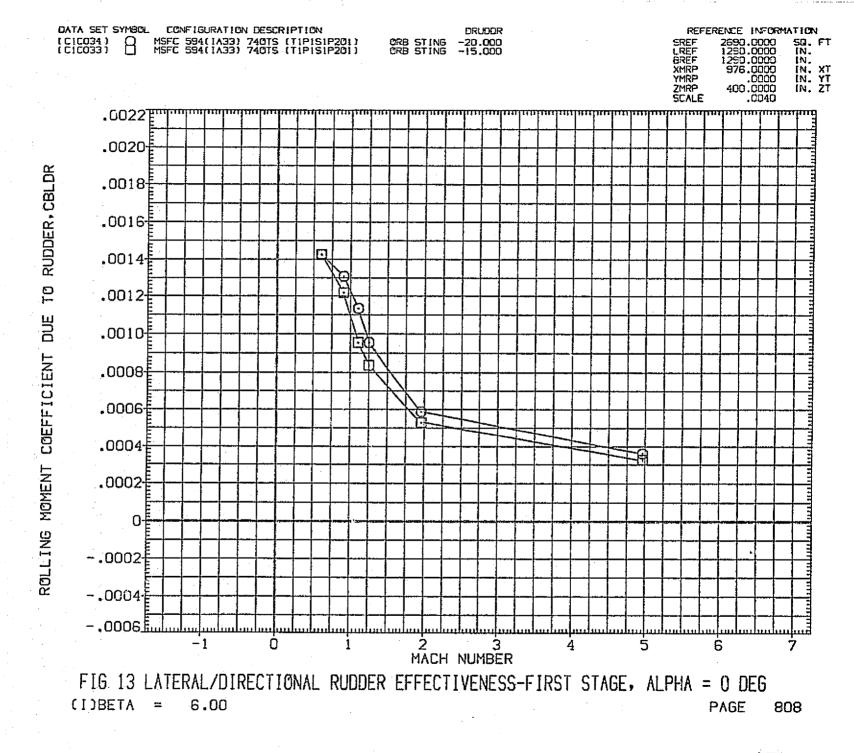


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(H)BETA = 4.00

PAGE 807





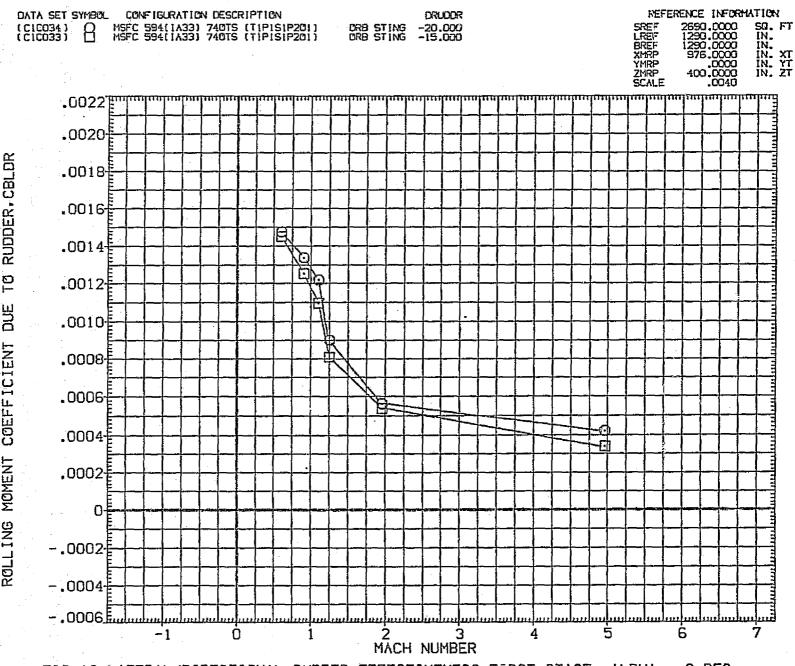
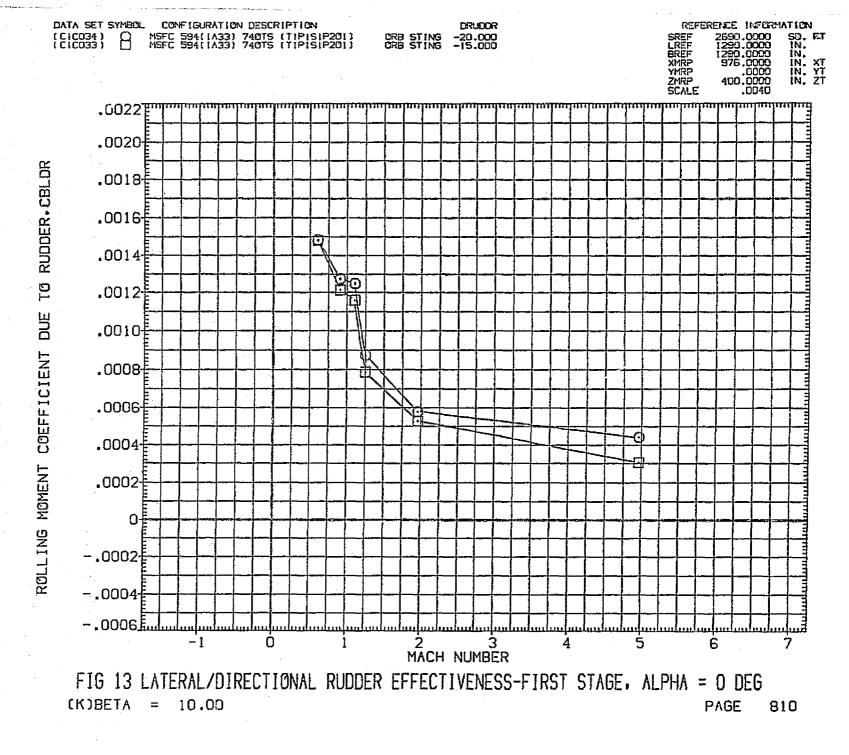


FIG 13 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(J)BETA = 8.00

PAGE 809



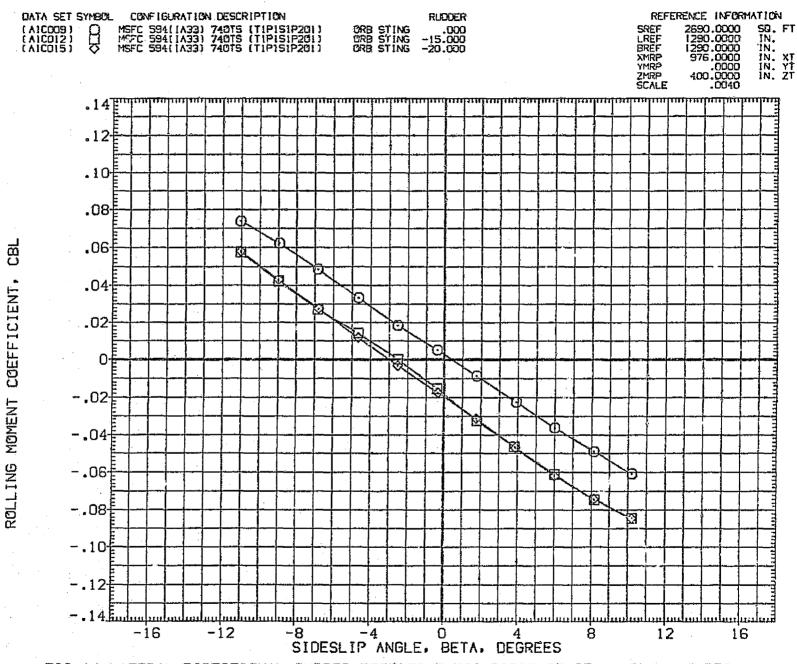


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(A)MACH = .60

PAGE 811

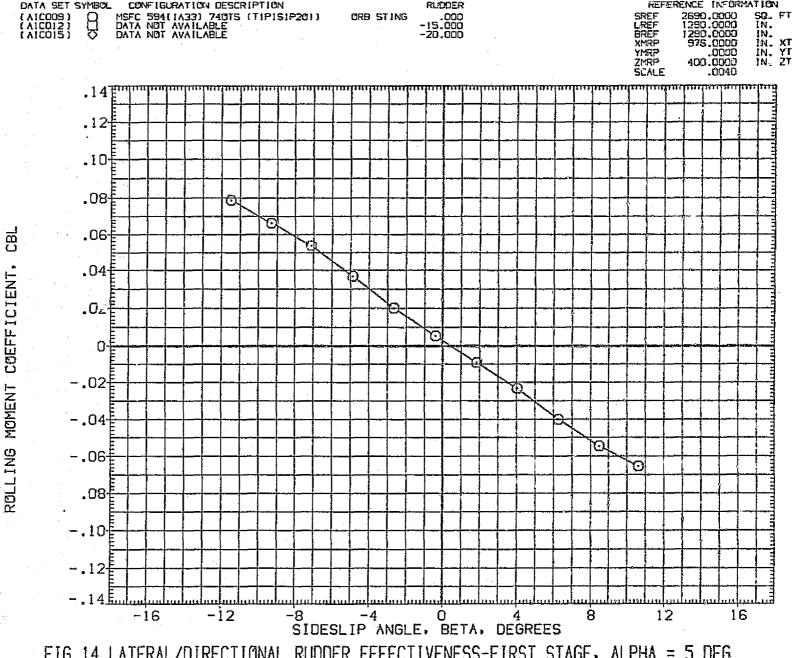


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(B)MACH = .80

PAGE 812



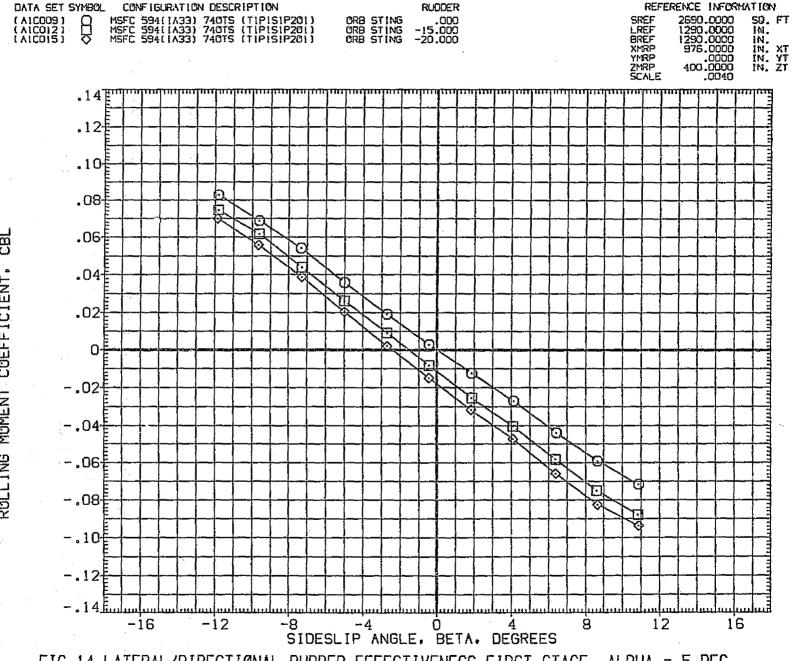
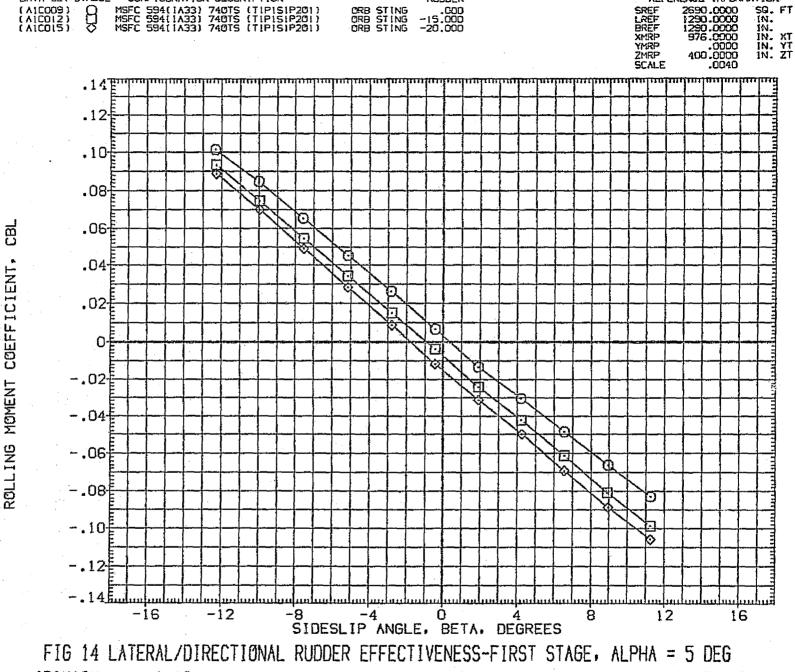


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(C)MACH = .91

PAGE 813



DATA SET SYMBOL

CONFIGURATION DESCRIPTION

REFERENCE INFERMATION

(D)MACH = 1.10PAGE 814



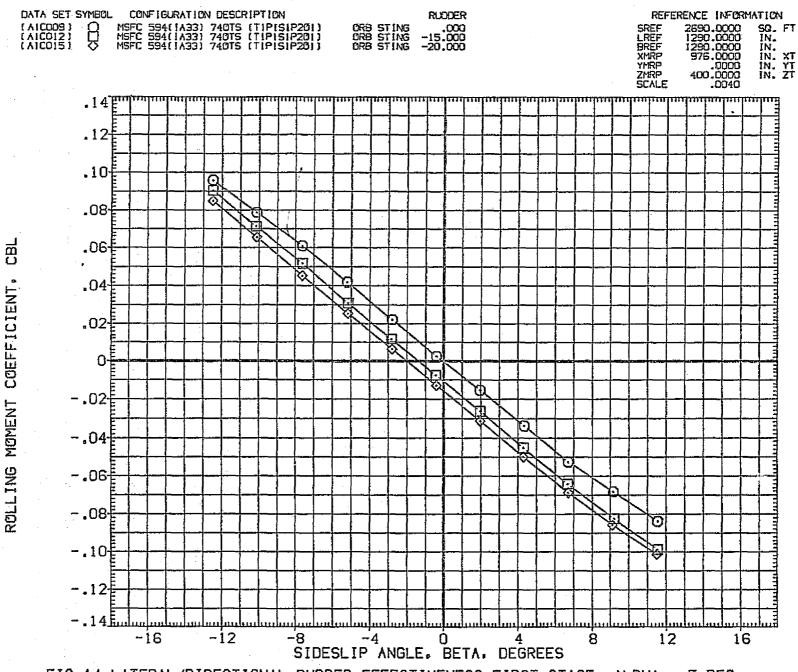


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(E)MACH = 1.25

PAGE 815

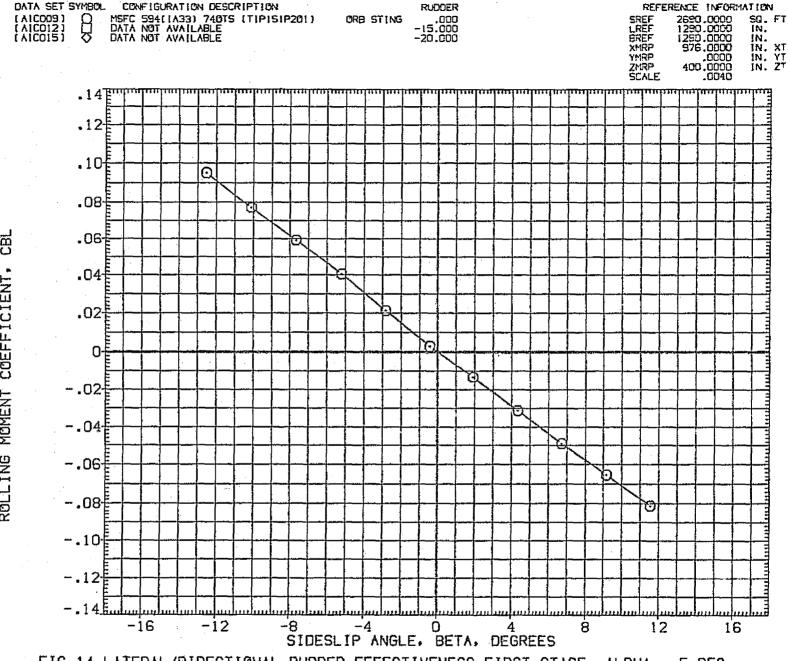


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(F)MACH = 1.46

PAGE 816

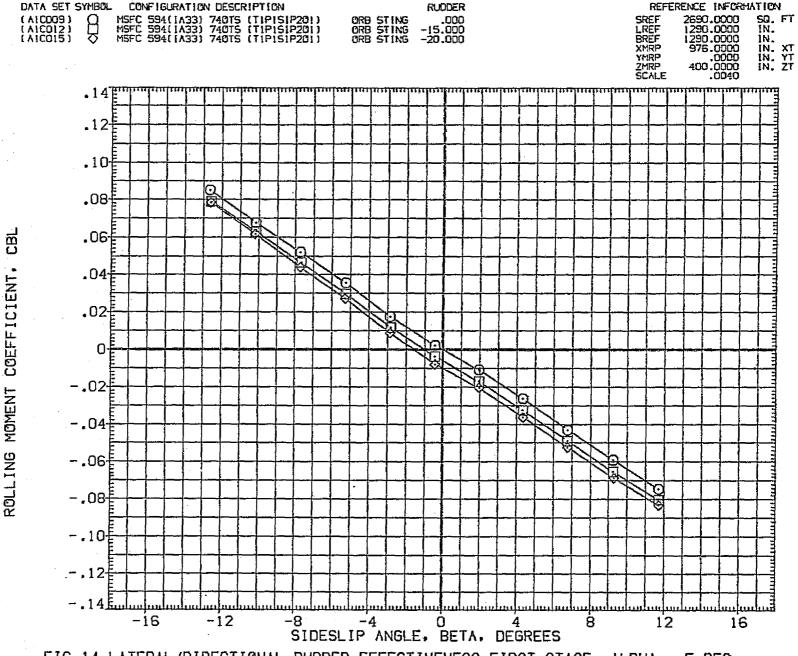
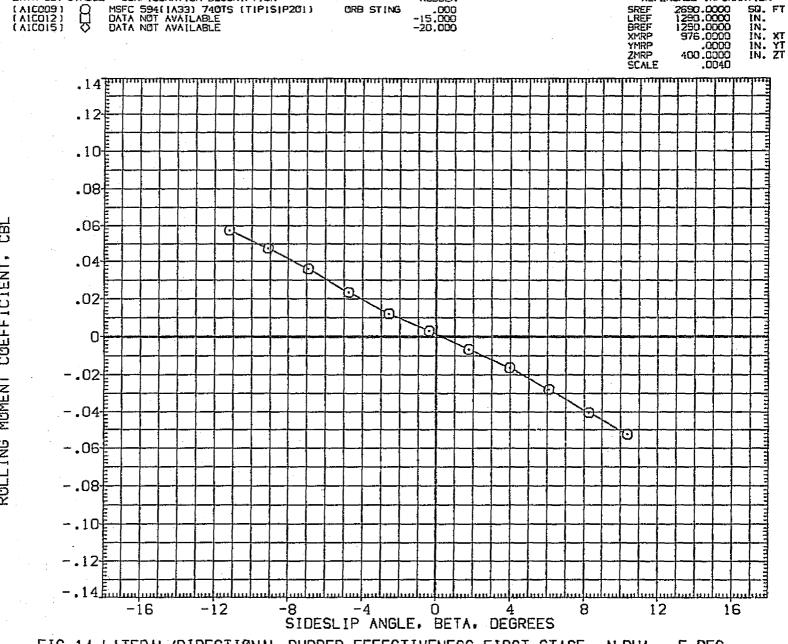


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE. ALPHA = 5 DEG

(G)MACH = 1.96

PAGE 817



REFERENCE INFORMATION

DATA SET SYMBOL. CONFIGURATION DESCRIPTION

FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(H)MACH = 2.99

PAGE 818

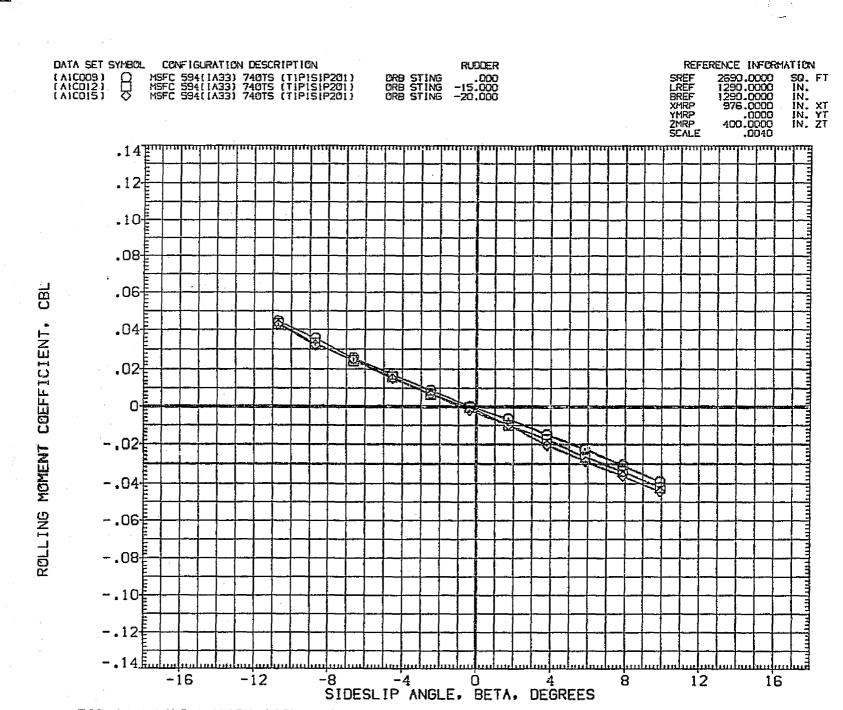


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(I)MACH = 4.96

PAGE 819

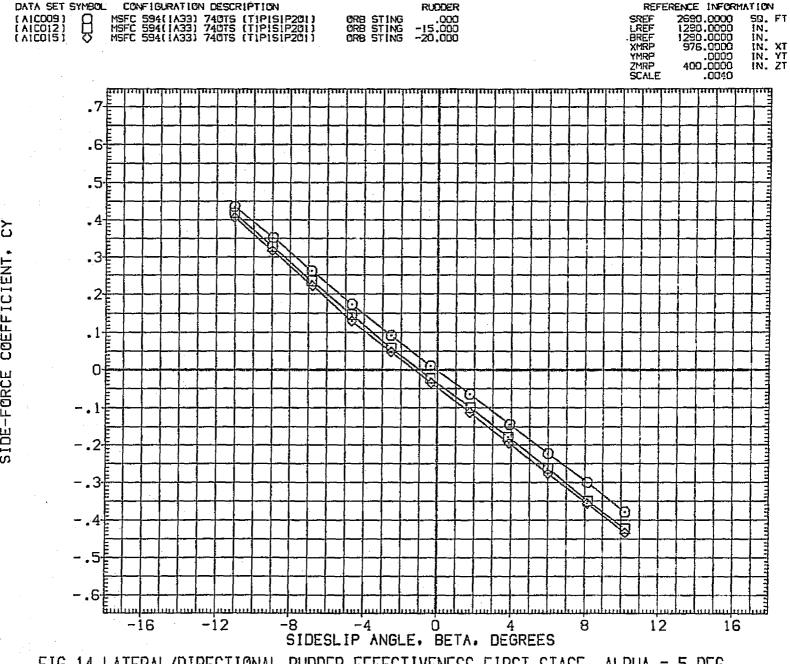


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

[A]MACH = .60

PAGE 820

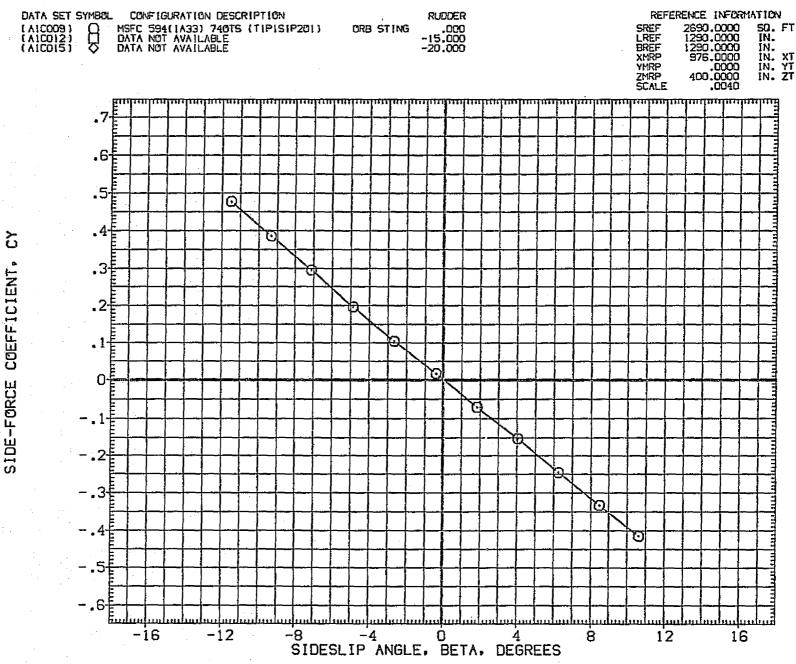


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE. ALPHA = 5 DEG

(B)MACH = .80

PAGE 821

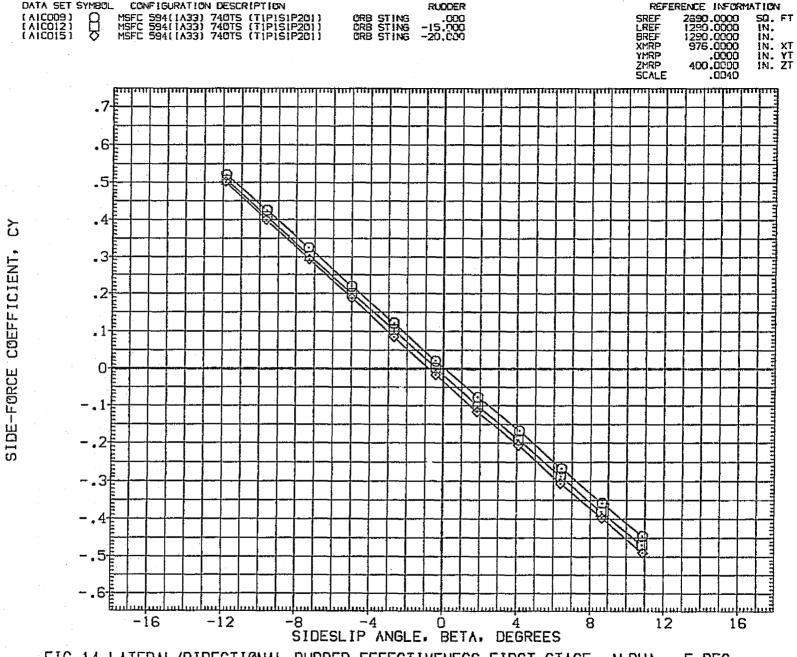


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(C)MACH = .91

PAGE 822

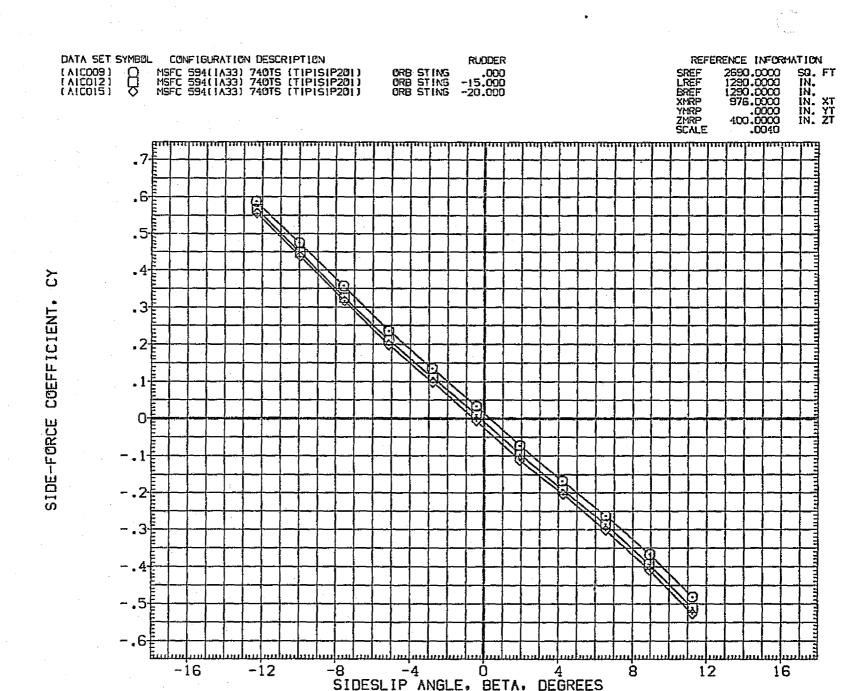


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(D)MACH = 1.10

PAGE 823

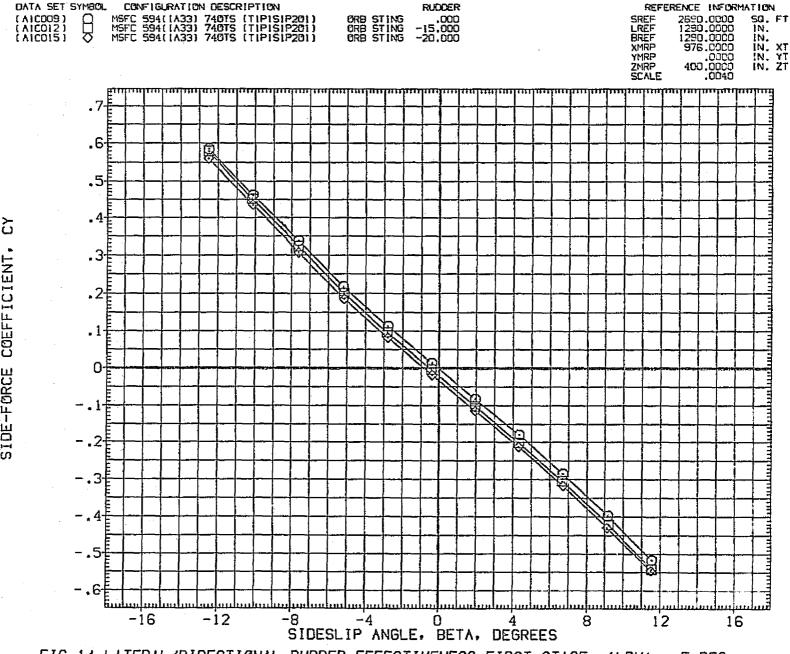


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG
(E)MACH = 1.25

PAGE 824



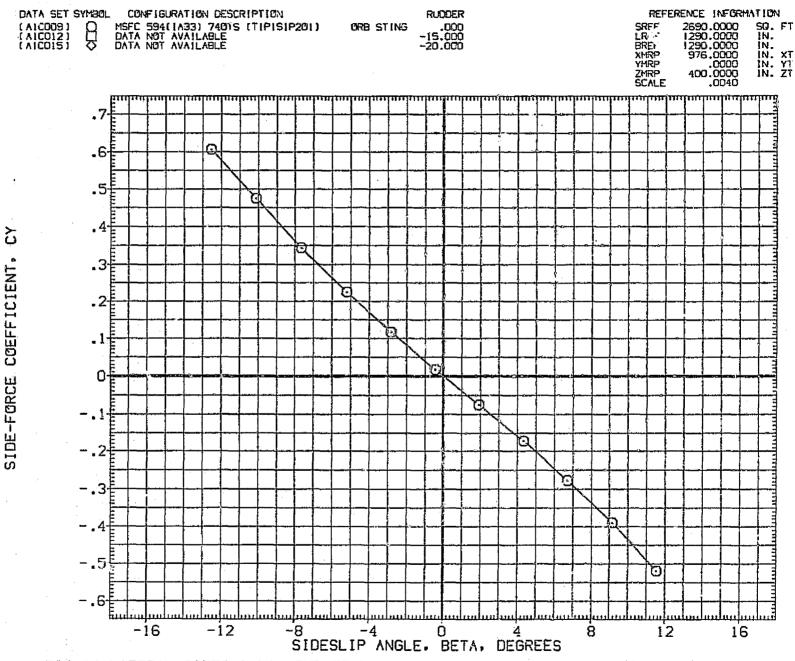


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(F)MACH = 1.46

PAGE 825

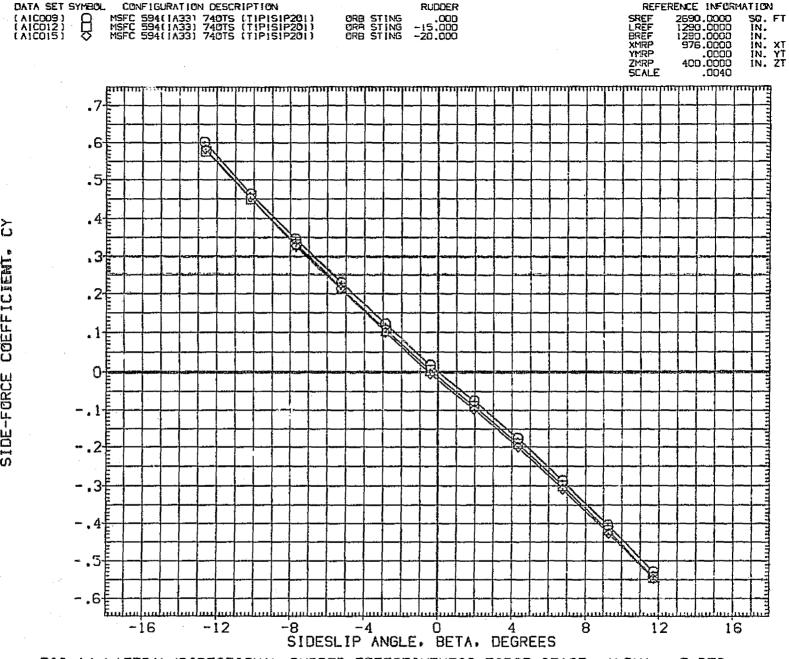


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE. ALPHA = 5 DEG

(G)MACH = 1.96

PAGE 826

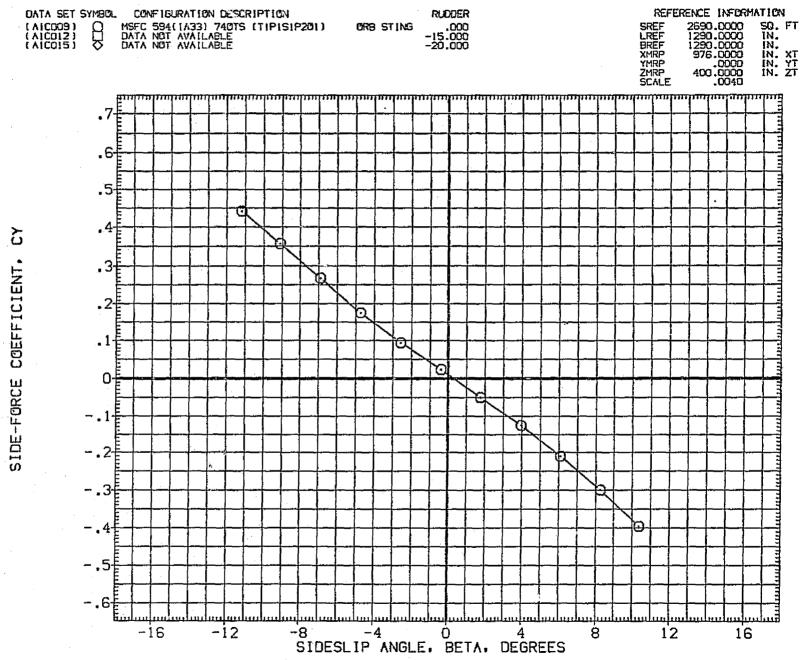
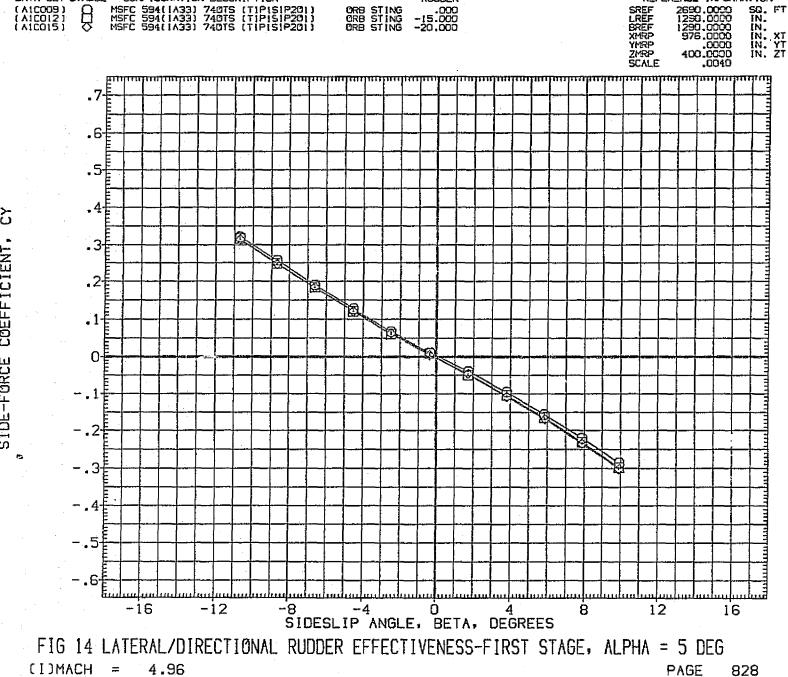


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE- ALPHA = 5 DEG

(H)MACH = 2.99

PAGE 827



RUDGER

REFERENCE INFORMATION

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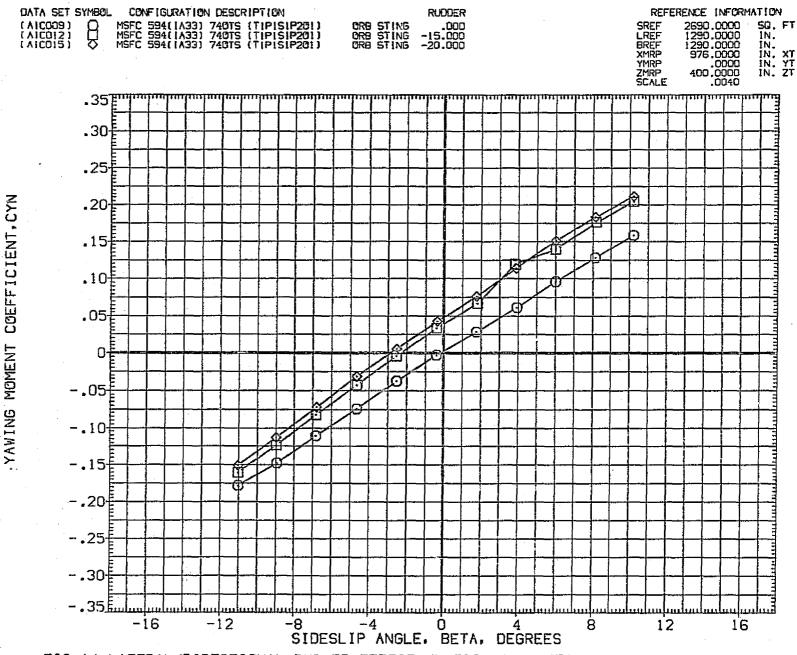
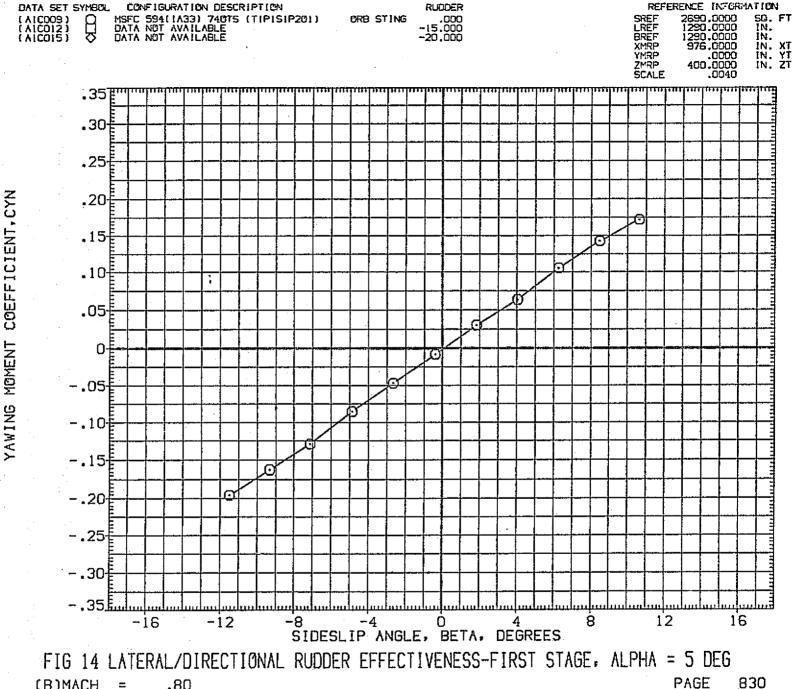


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

[A)MACH = .60 PAGE 829



PAGE (B)MACH = .80

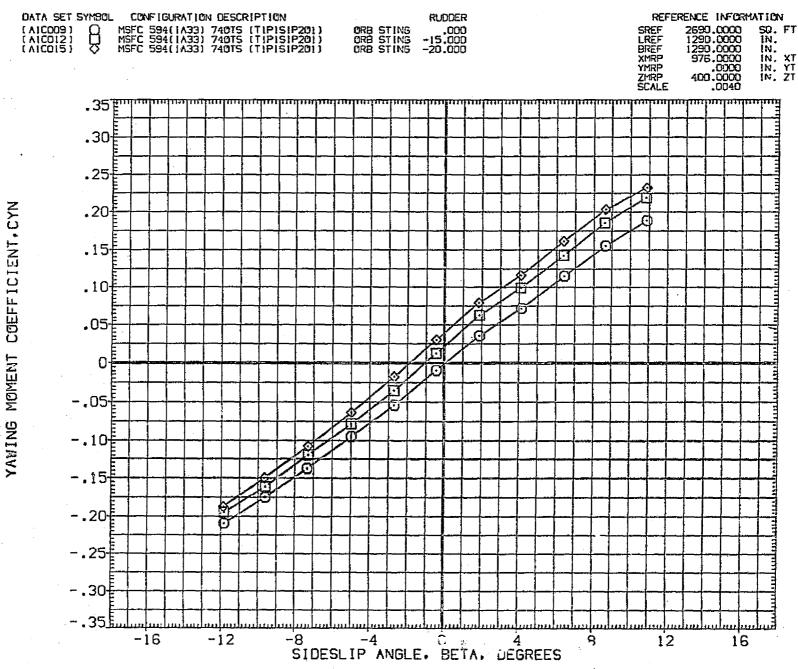


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG COMACH = .91

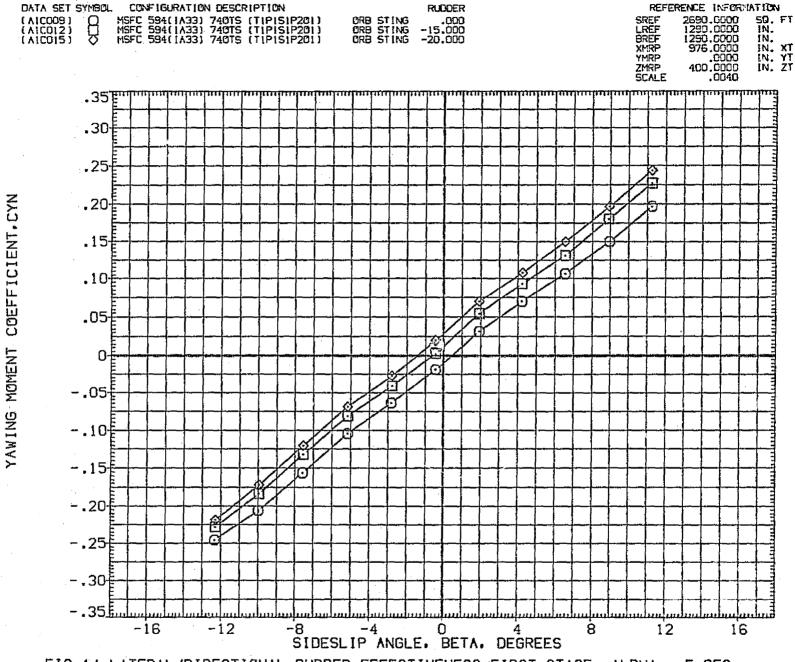


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE. ALPHA = 5 DEG

(D)MACH = 1.10

PAGE 832

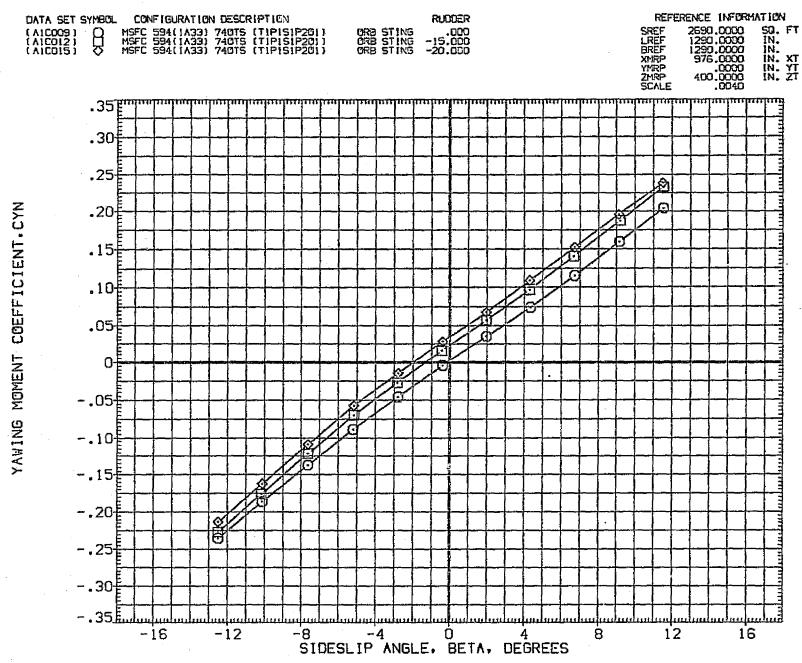
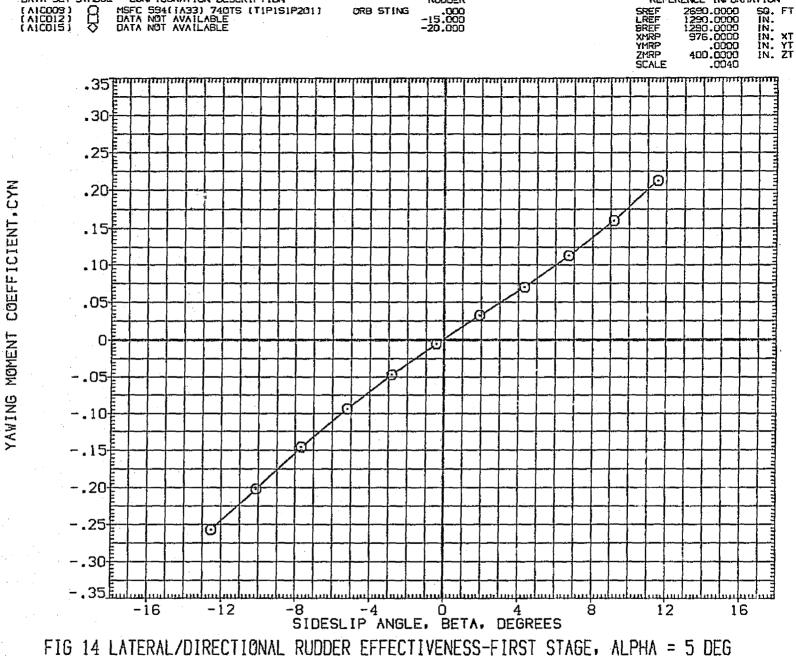


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(E)MACH = 1.25

PAGE 833



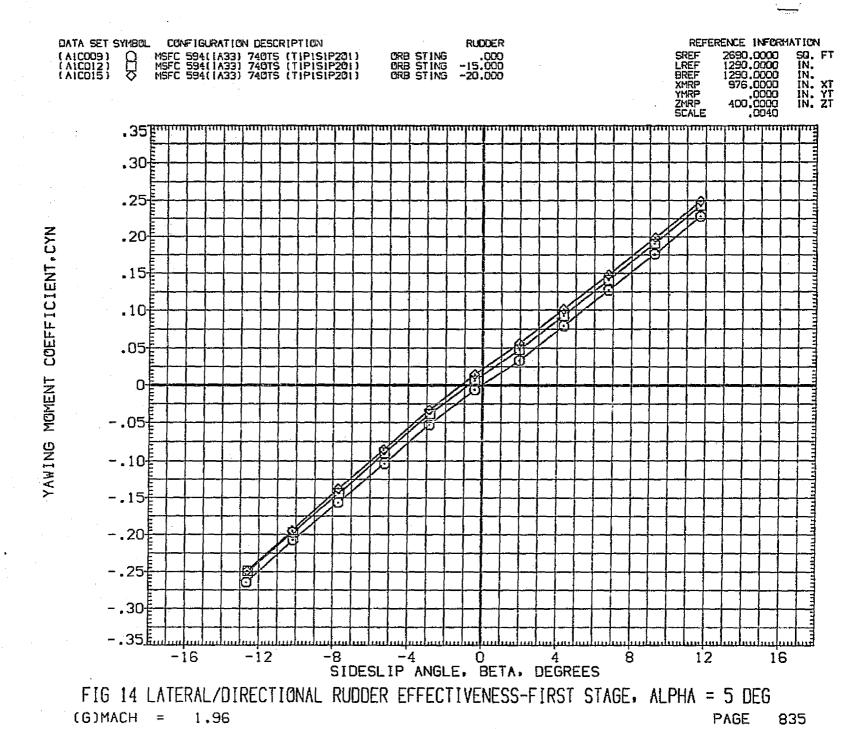
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CONFIGURATION DESCRIPTION

DATA SET SYMBOL

(F)MACH = 1.46 PAGE 834





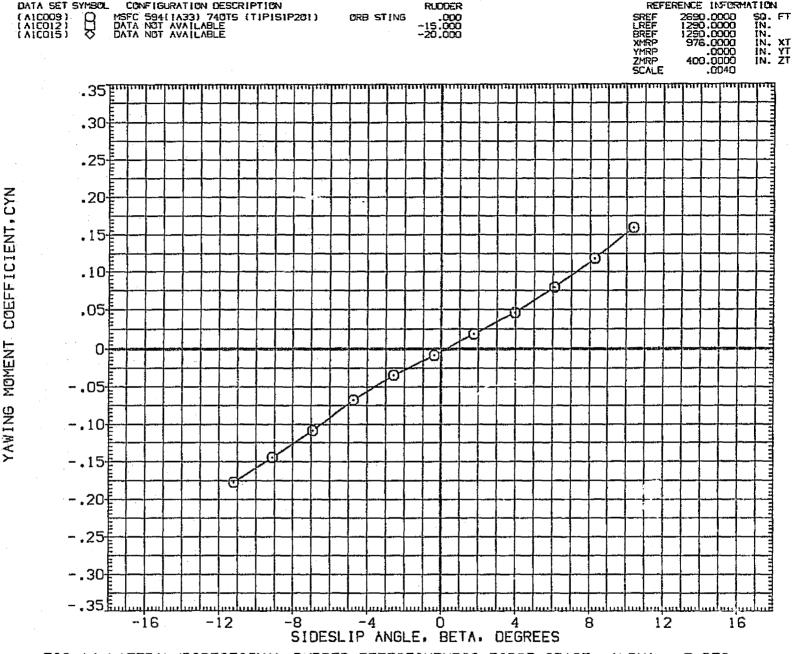


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(H)MACH = 2.99

PAGE 836

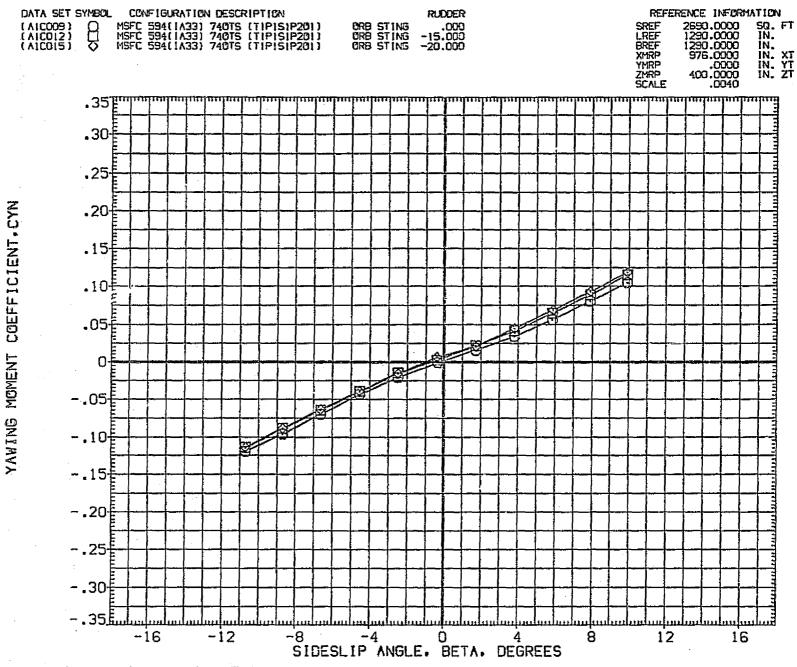
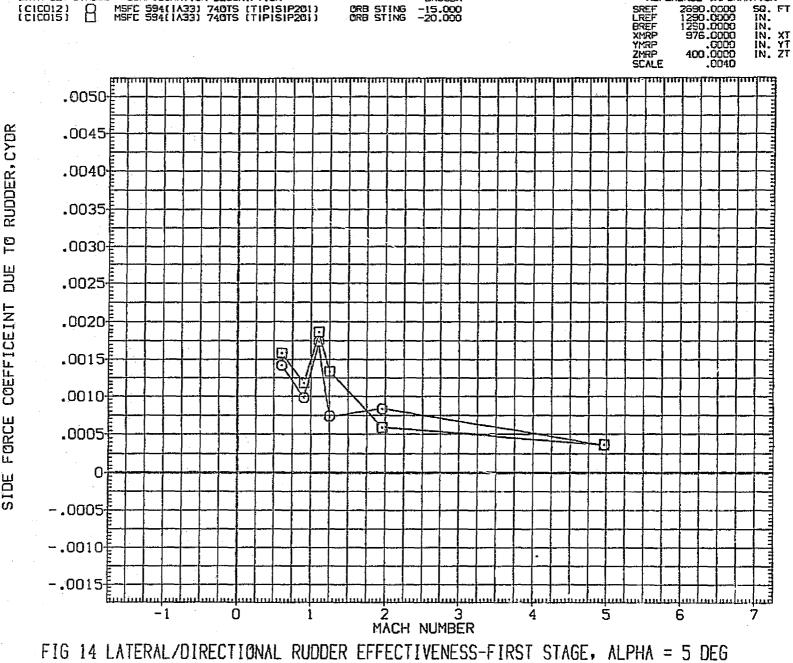


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE. ALPHA = 5 DEG

(I)MACH = 4.96

PAGE 837



REFERENCE INFORMATION

CONFIGURATION DESCRIPTION

FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(A)BETA = -10.00

PAGE 838



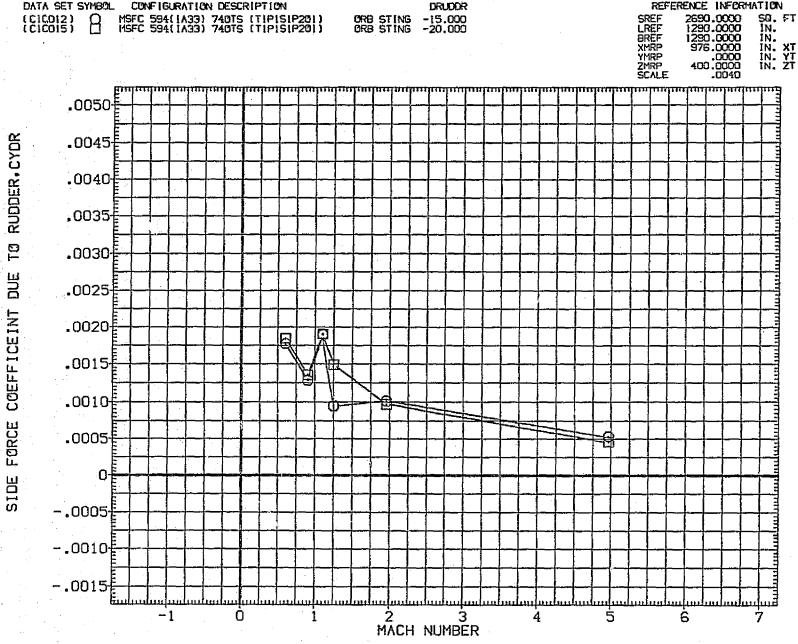


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(B)BETA = -8.00

PAGE 839

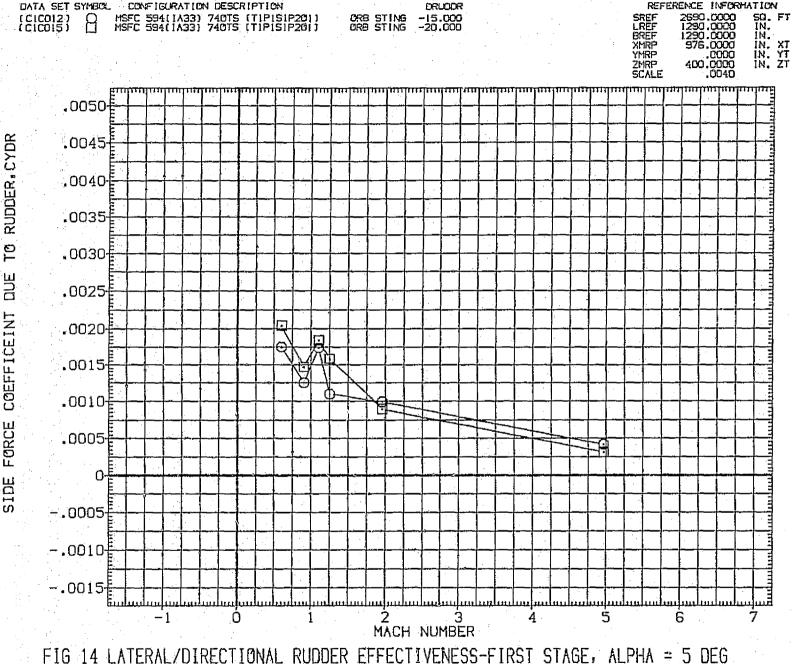


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

CCOBETA = -6.00 PAGE 840

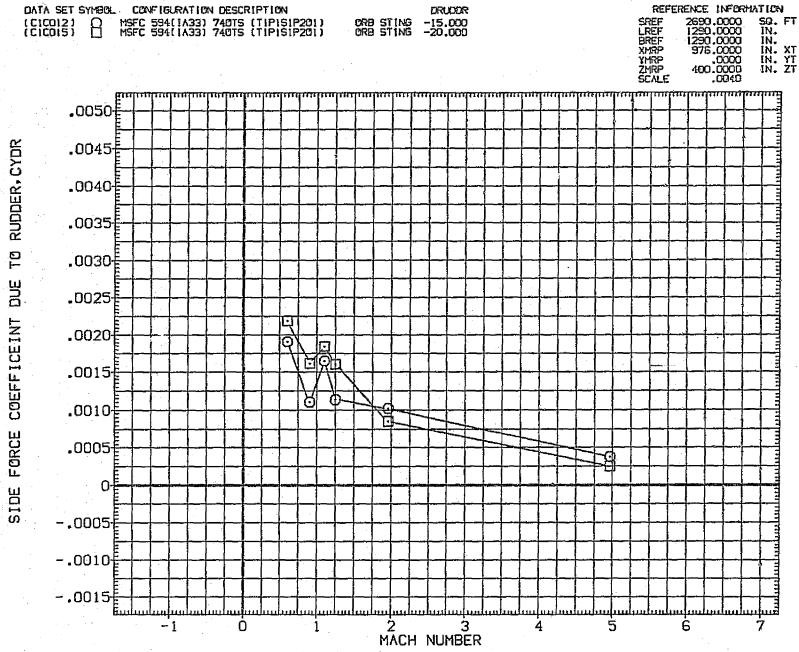
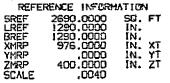


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(D)BETA = -4.00

PAGE 841

ORB STING -15.000 ORB STING -20.000



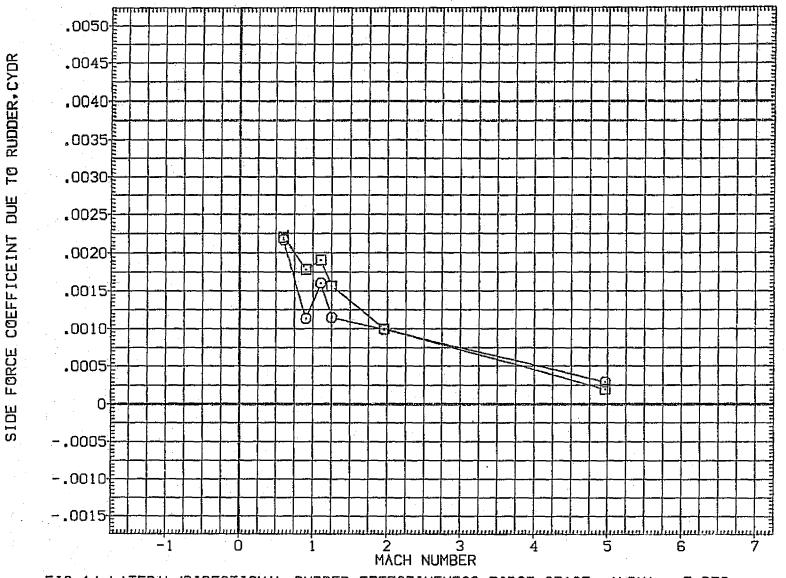


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE. ALPHA = 5 DEG

(E)BETA = -2.00

PAGE 842



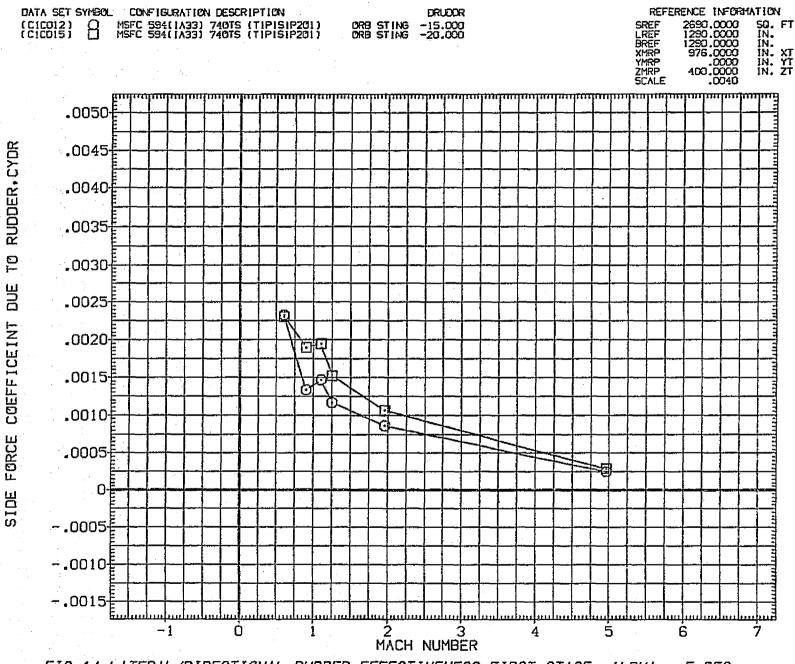


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(F)BETA = .00

PAGE 843

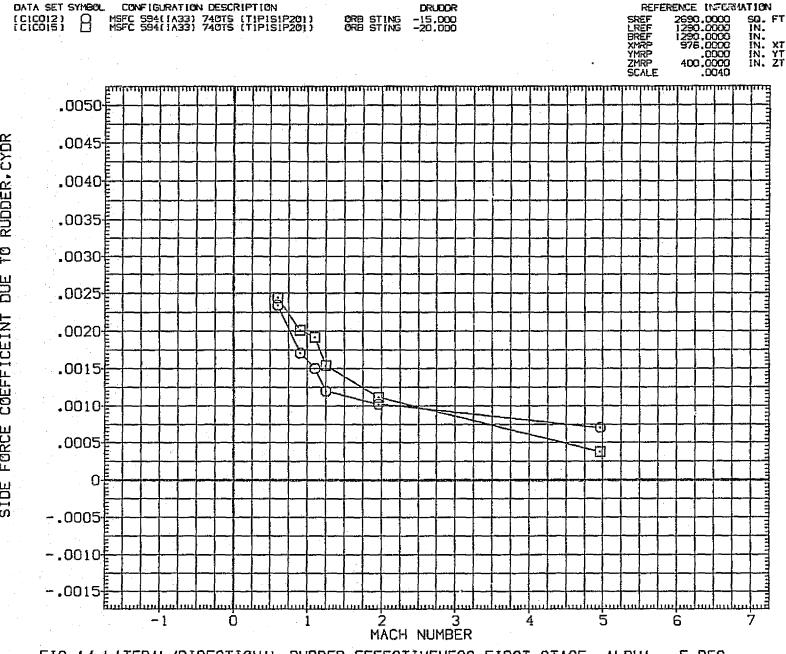


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(G)BETA = 2.00 PAGE 844

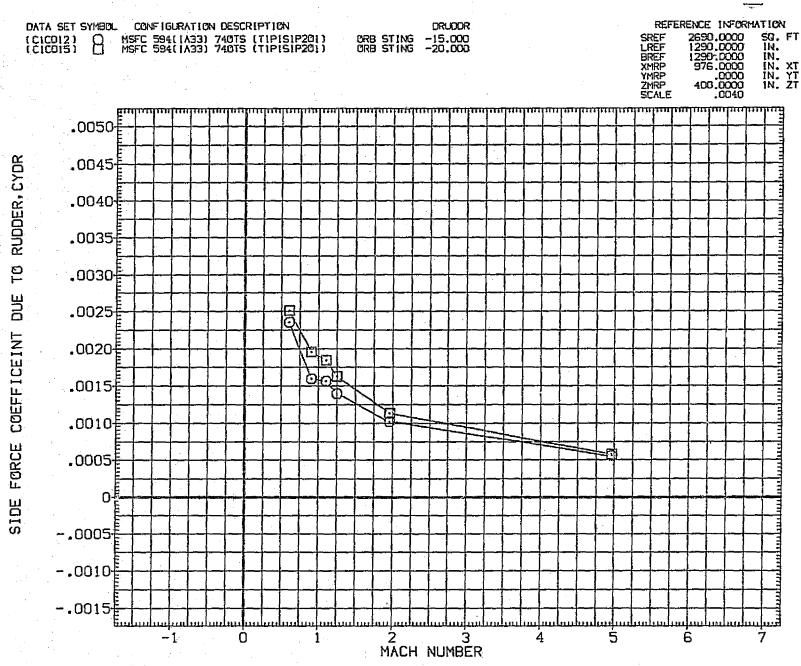


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE. ALPHA = 5 DEG

(H)BETA = 4.00

PAGE 845

DATA SET SYMBOL CONFIGURATION DESCRIPTION

FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

CIDBETA = 6.00

PAGE 846



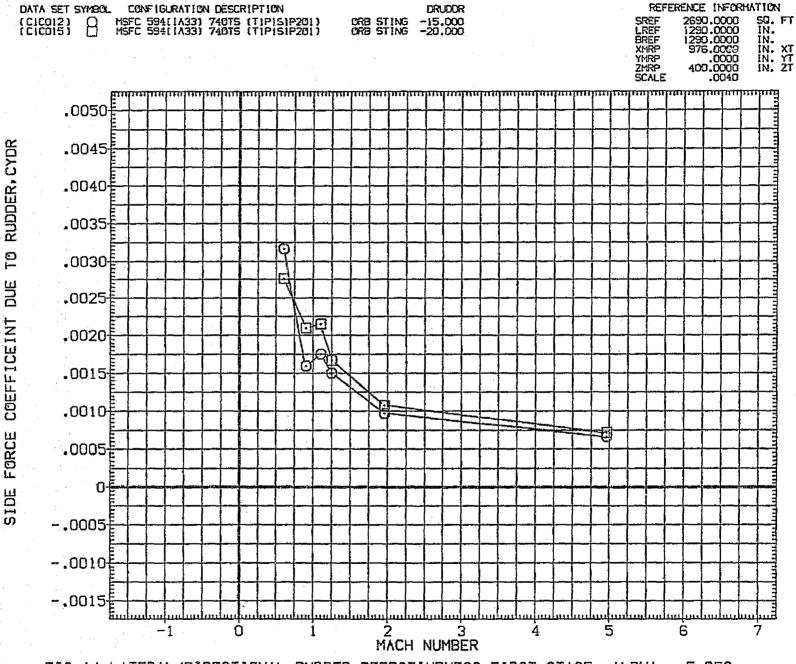


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(J)BETA = 8.00

PAGE 847

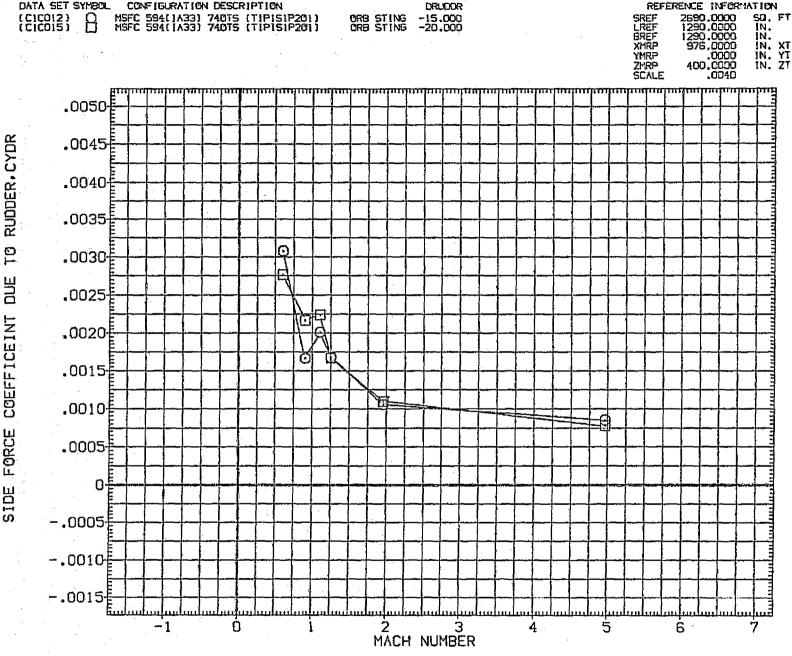


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(K)BETA = 10.00

PAGE 848

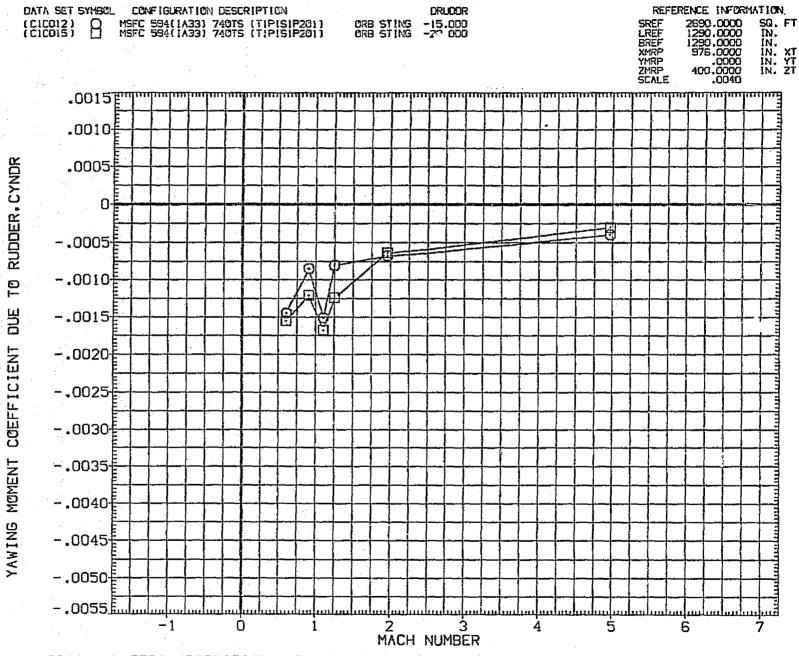


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(A)BETA = -10.00

PAGE 849



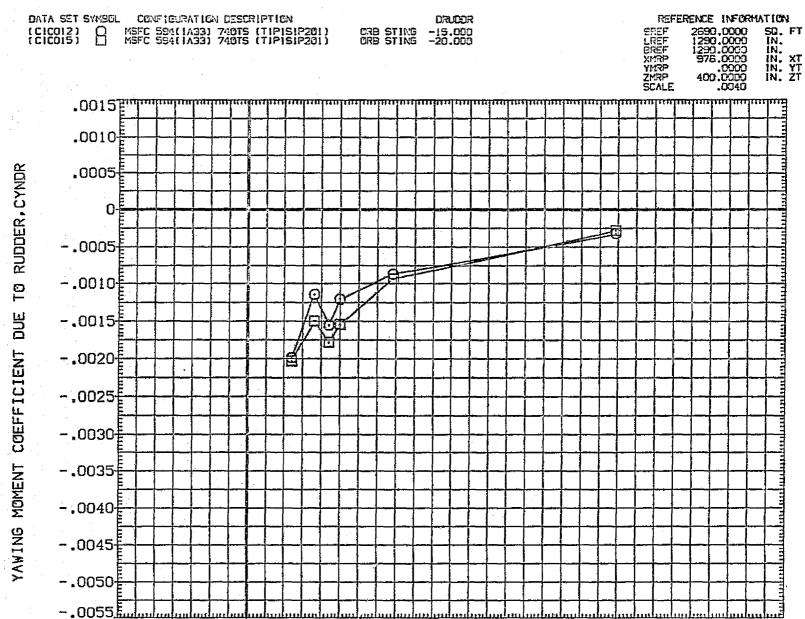


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(C)BETA = -6.00

PAGE 851

MACH NUMBER

3

6

2

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REFERENCE INFORMATION

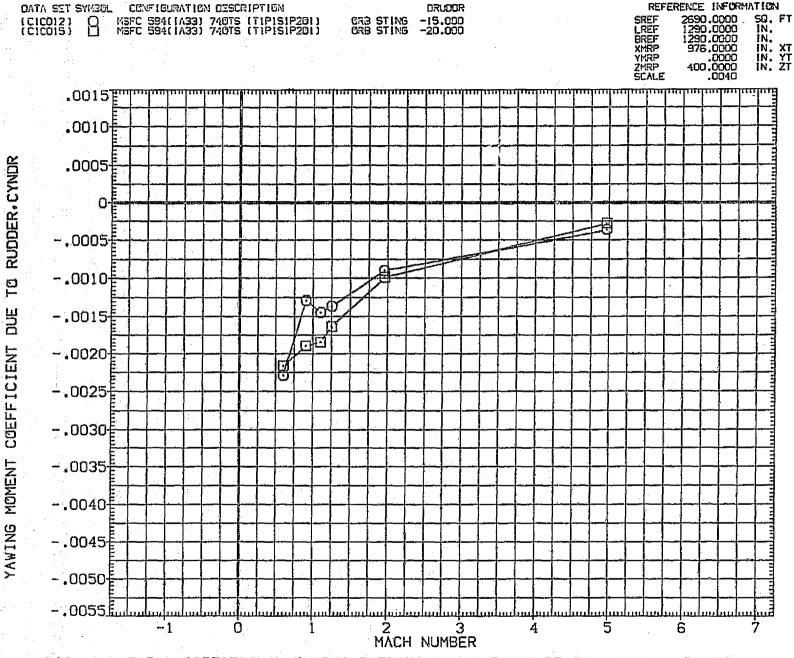
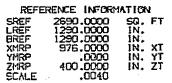


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG
(E)BETA = -2.00
PAGE 853



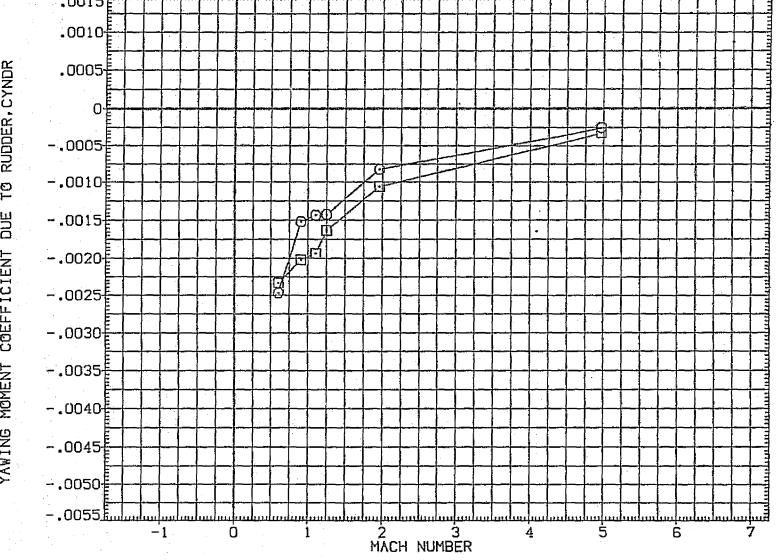


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG (F)BETA = :00 PAGE 854

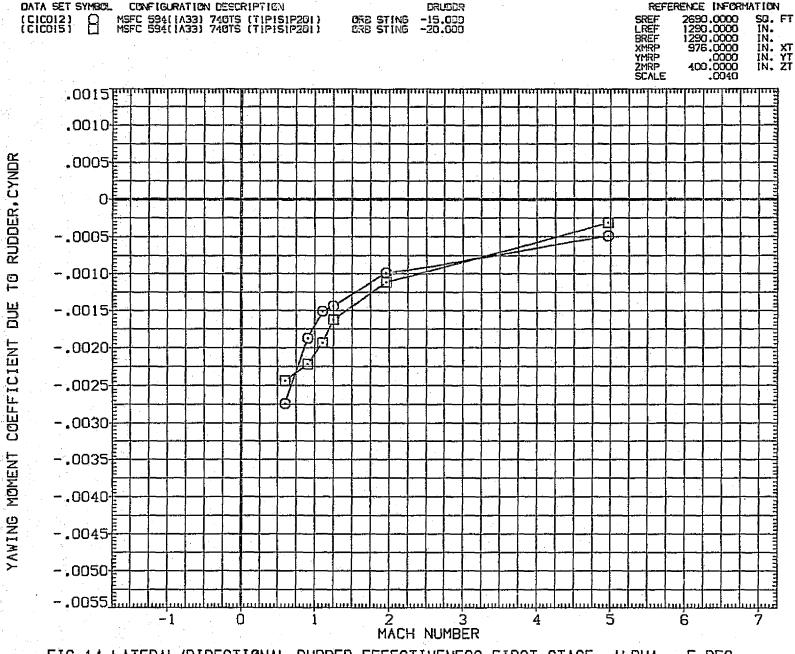


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(G)BETA = 2.00 PAGE 855

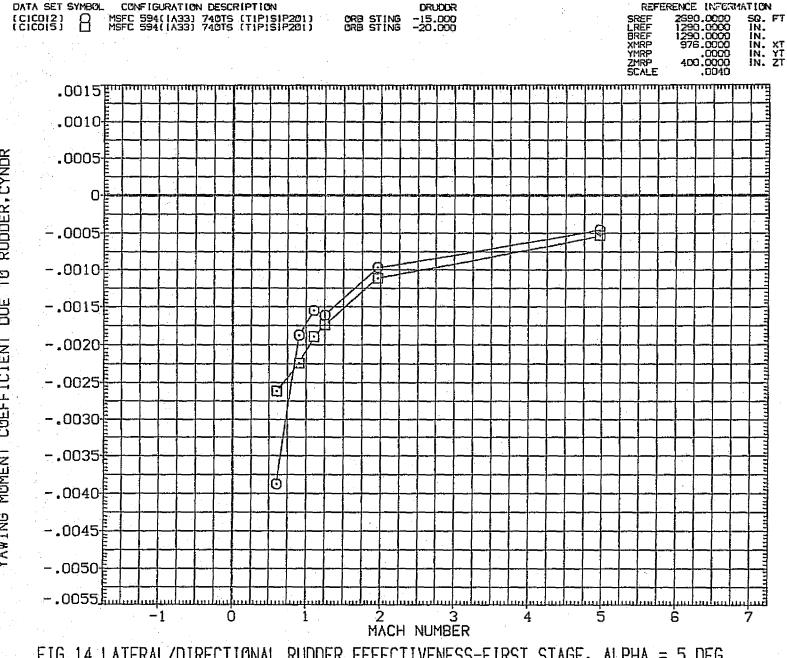


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(H)BETA = 4.00

PAGE 856

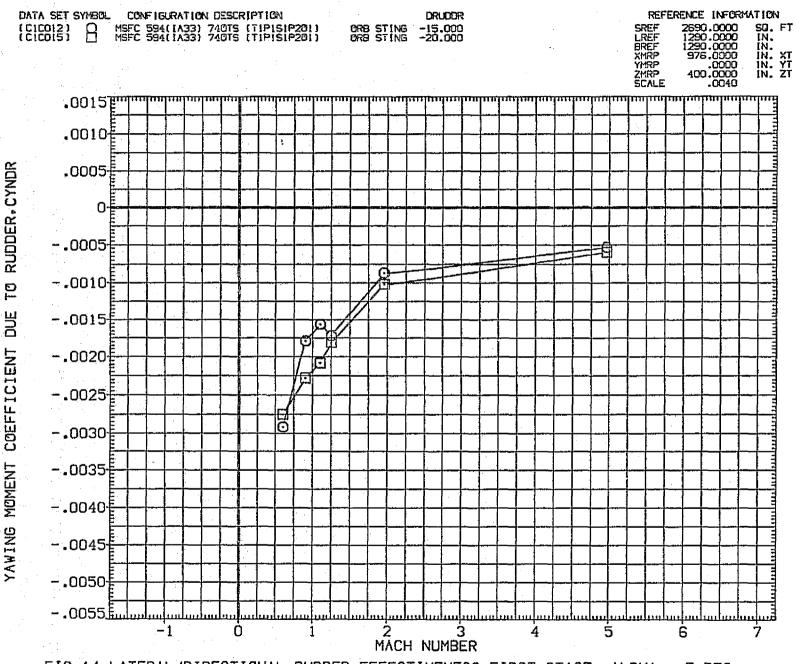
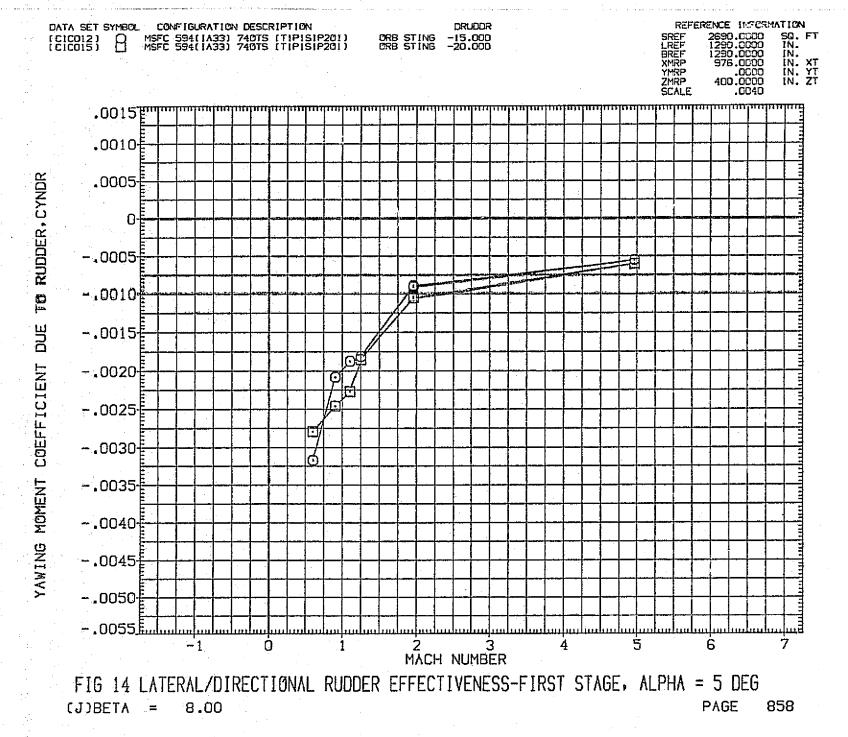


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE. ALPHA = 5 DEG

(I)BETA = 6.00

PAGE 857



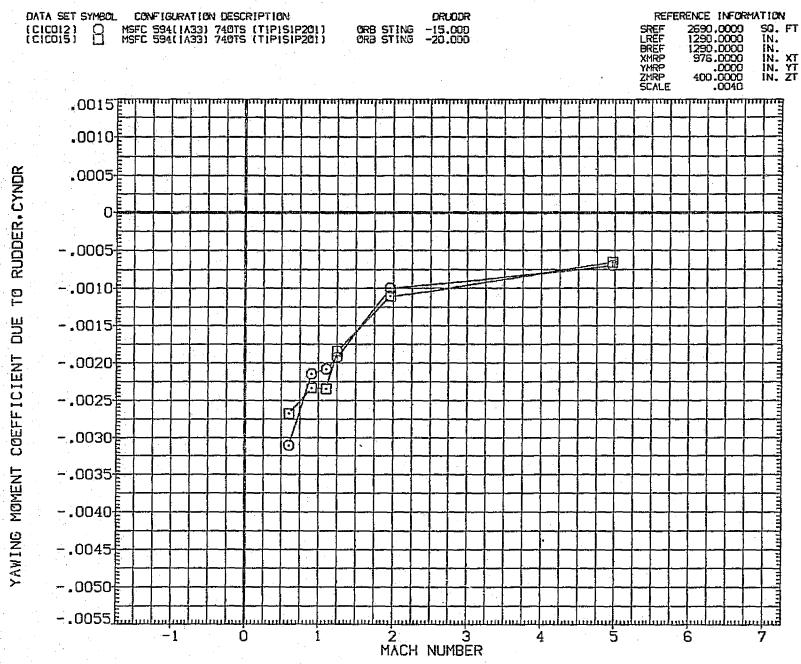


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(K)BETA = 10.00

PAGE 859

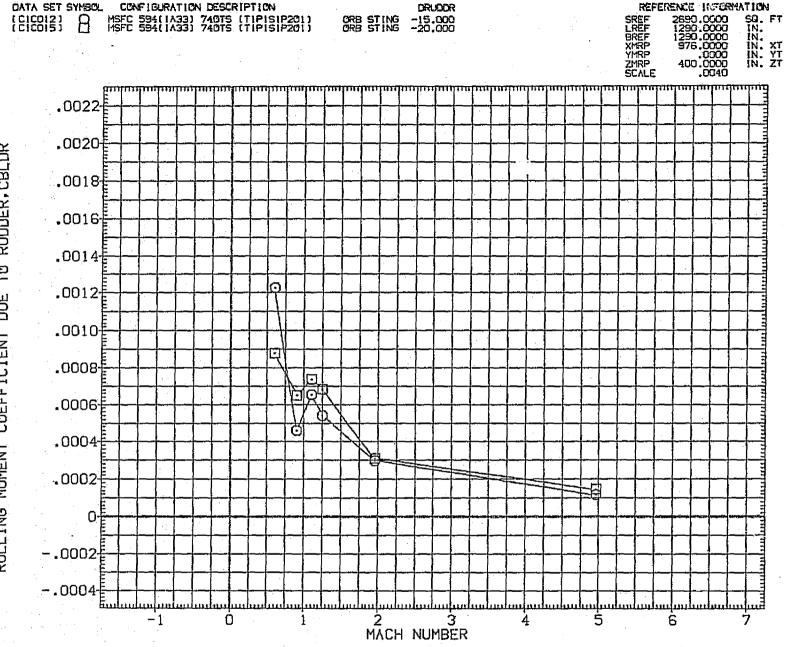


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(A)BETA = -10.00

PAGE 860

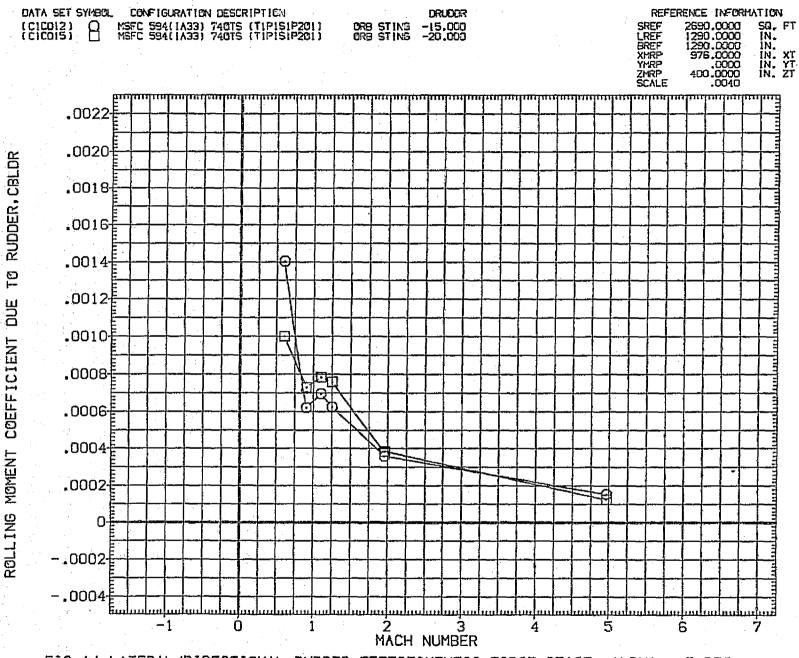
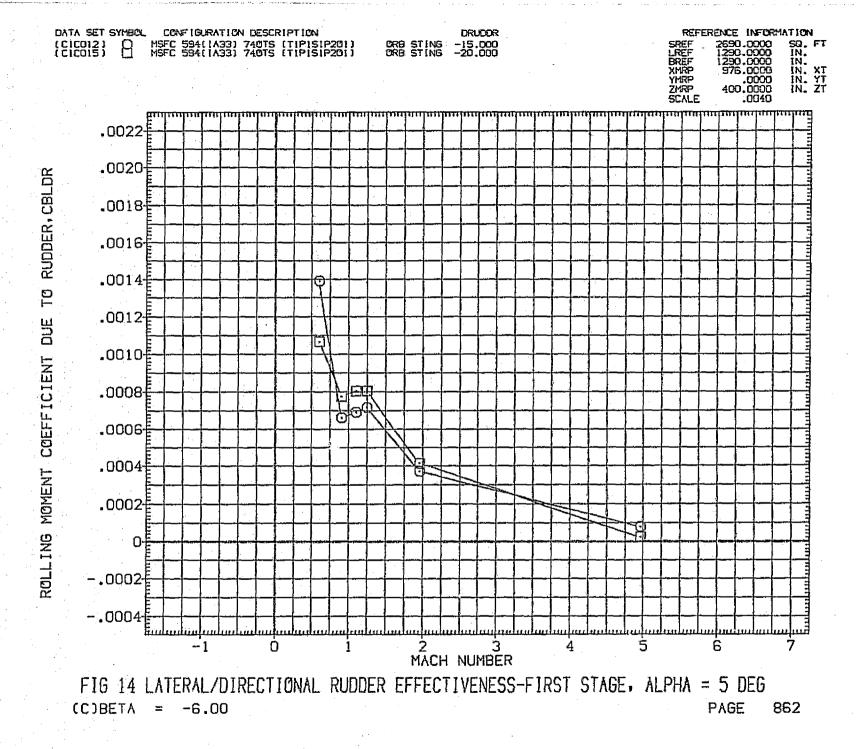


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG
(B)BETA = -8.00

PAGE 861





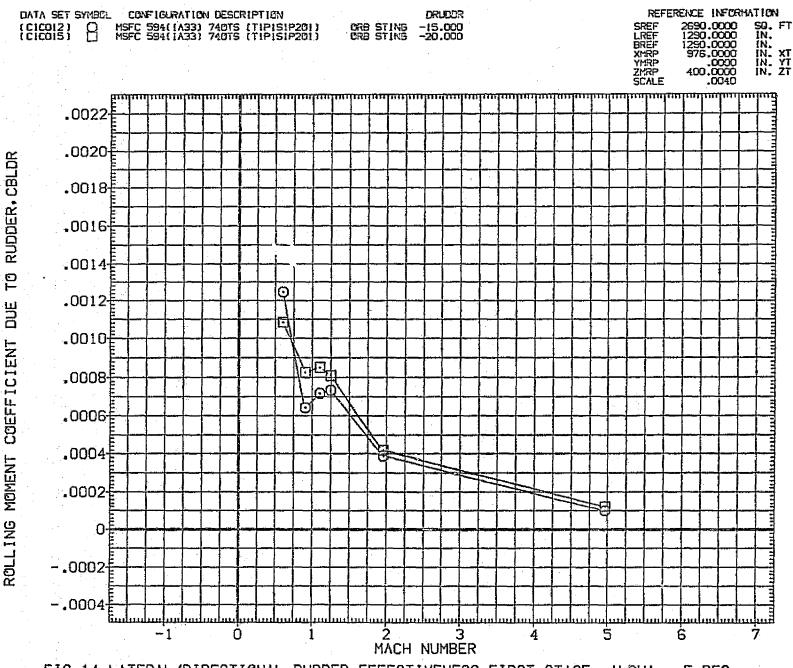
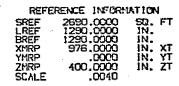


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG (D)BETA = -4.00PAGE 863



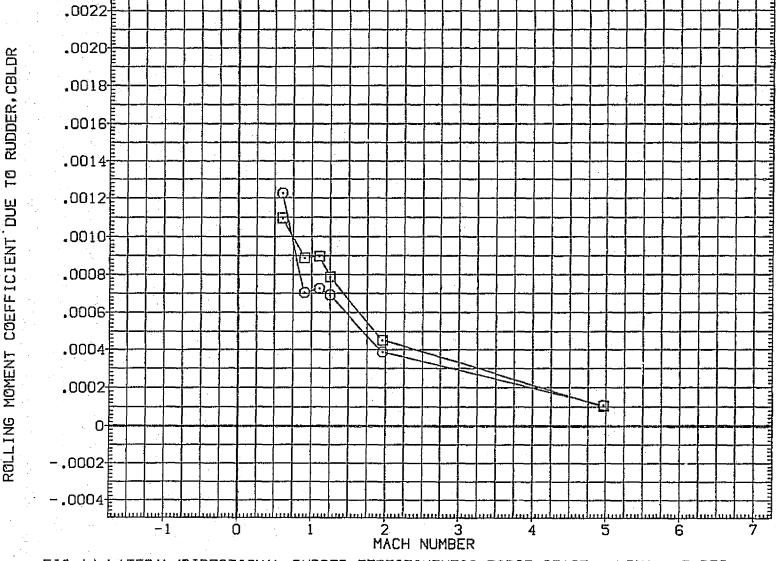


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(E)BETA = -2.00

PAGE 864

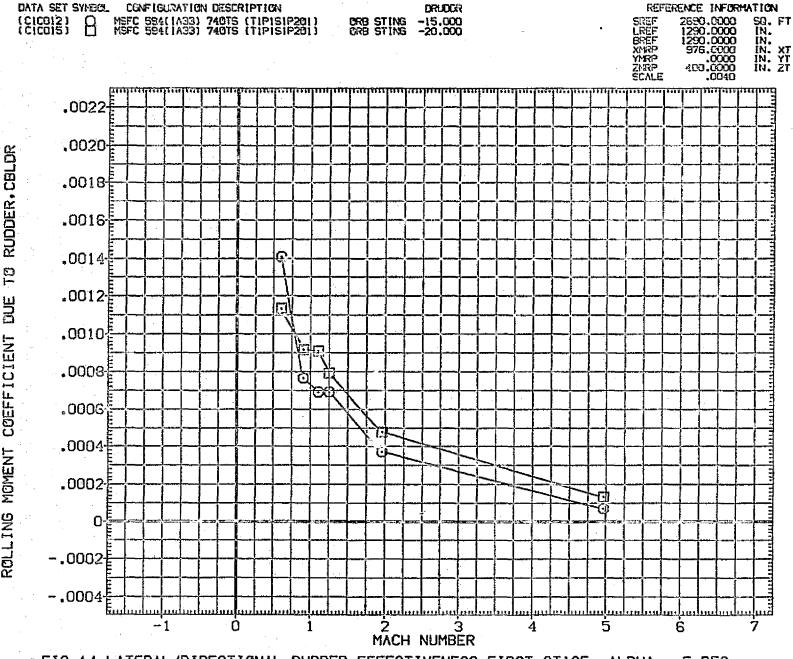


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(F)BETA = .00

PAGE 865

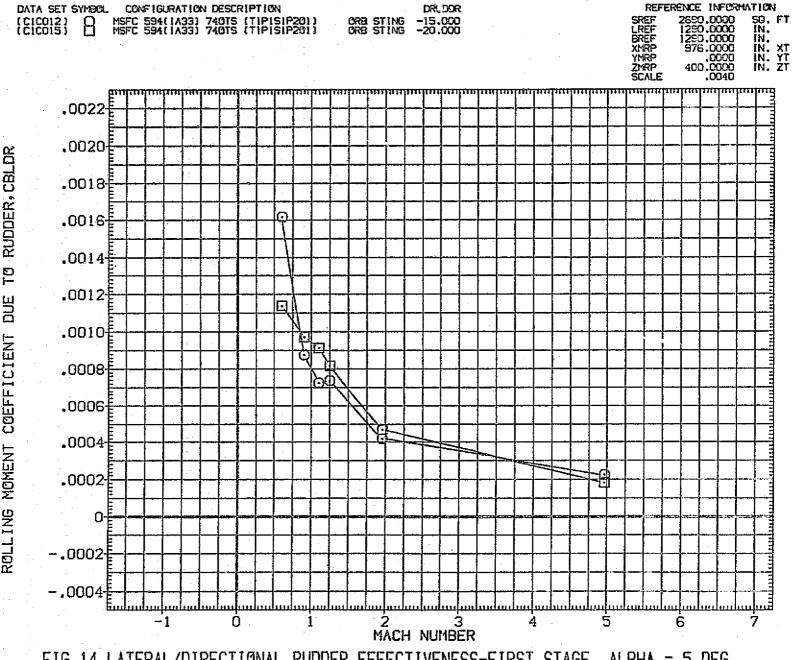


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE. ALPHA = 5 DEG

(G)BETA = 2.00

PAGE 866

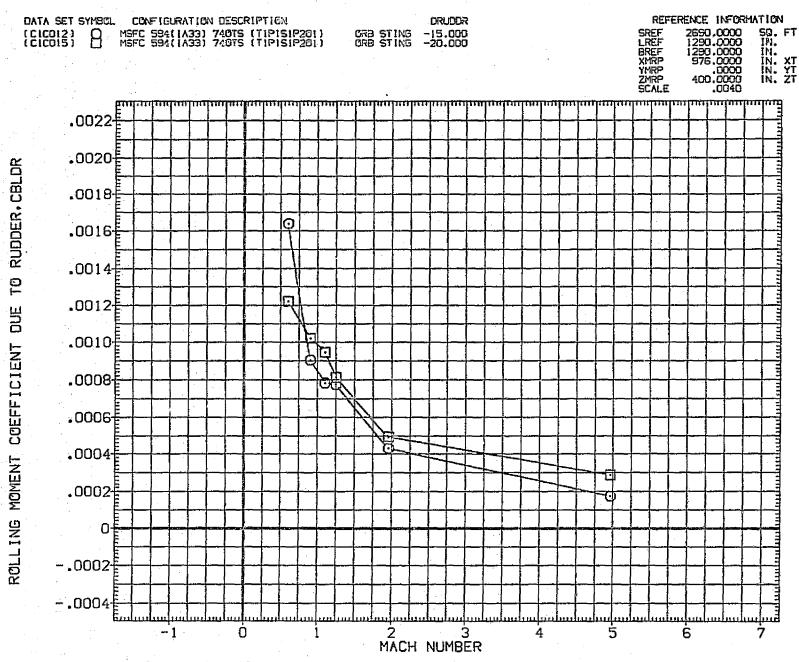


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

CH)BETA = 4.00

PAGE 867

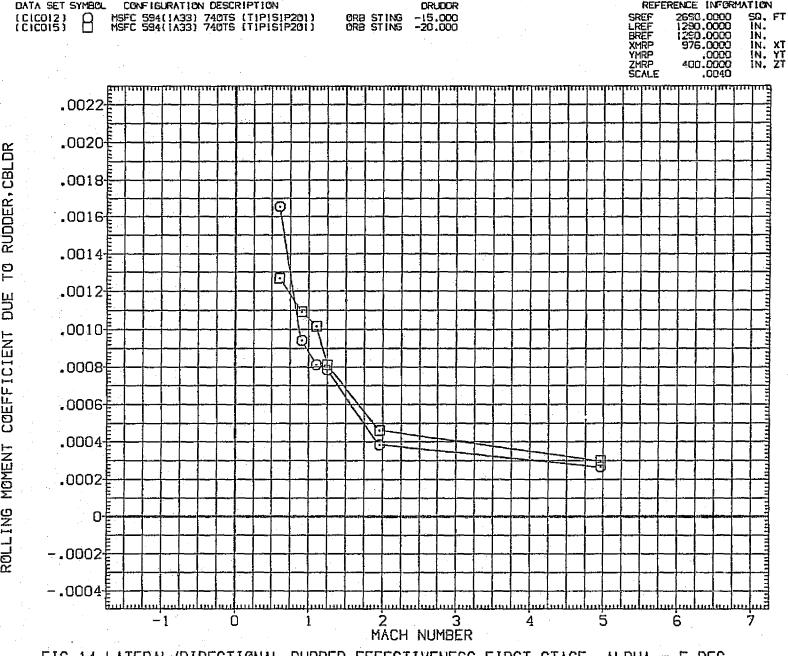


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

CIDBETA = 6.00

PAGE 868

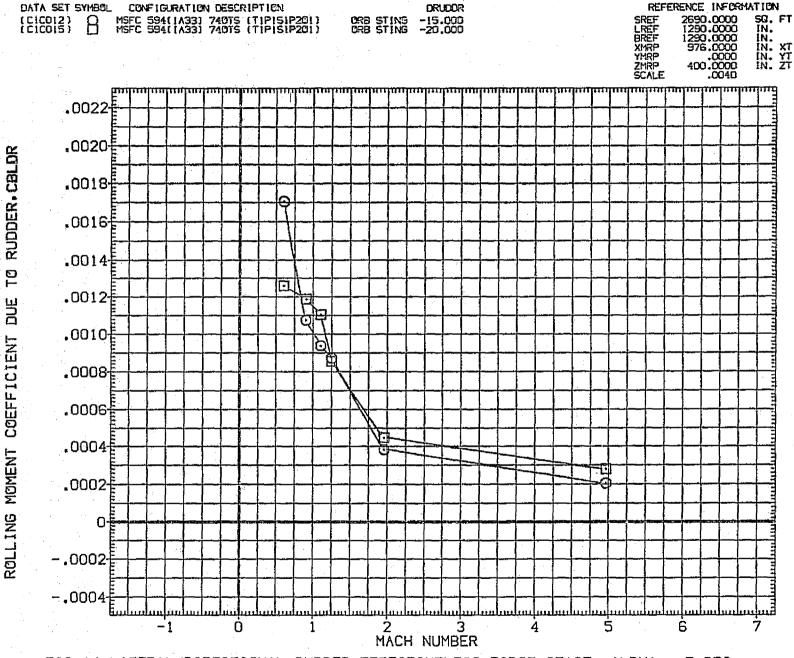


FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

CJOBETA = 8.00 PAGE 869

DATA SET SYMBOL CONFIGURATION DESCRIPTION

FIG 14 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA = 5 DEG

(K)BETA = 10.00

PAGE 870

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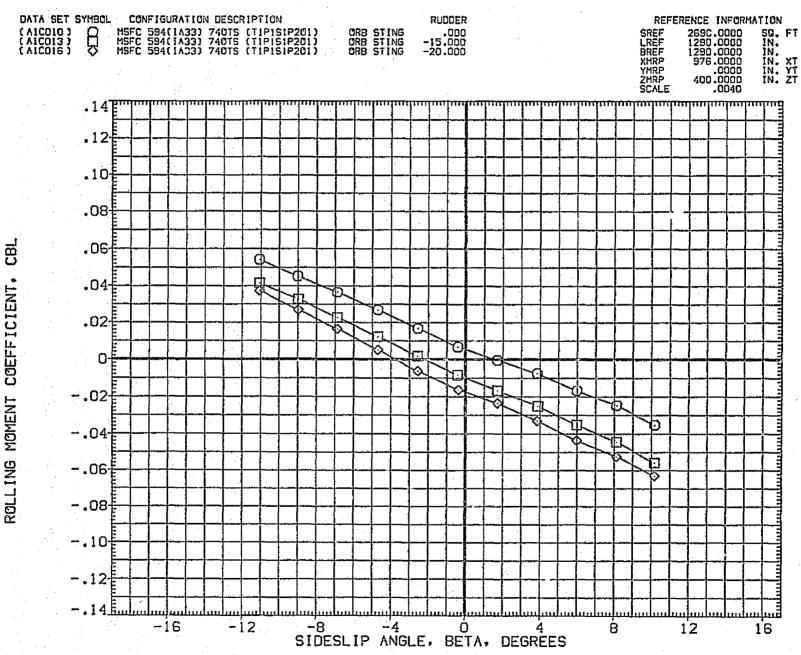
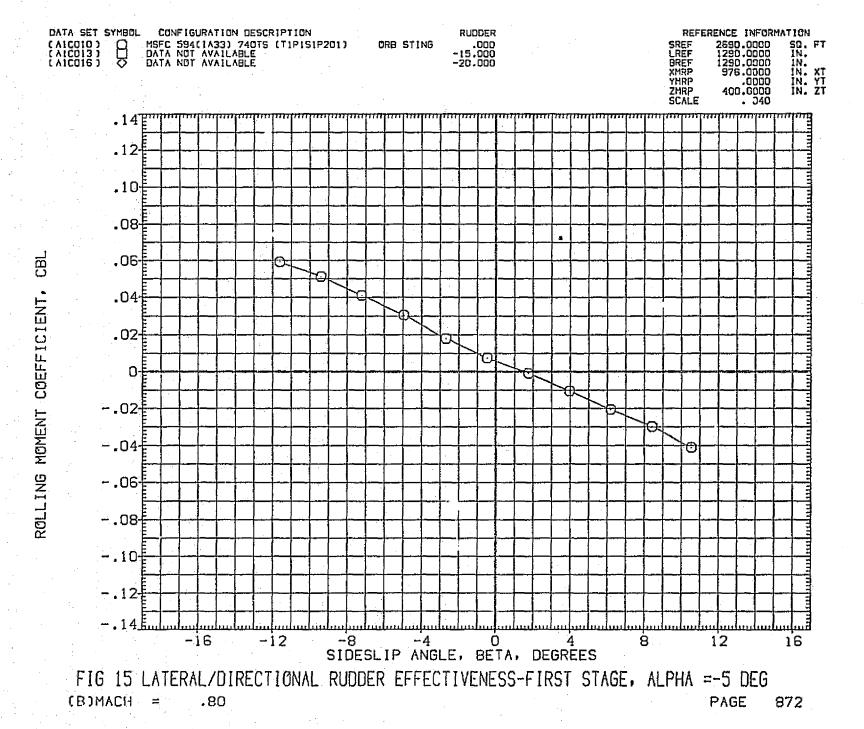


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

(A)MACH = .60

PAGE 871



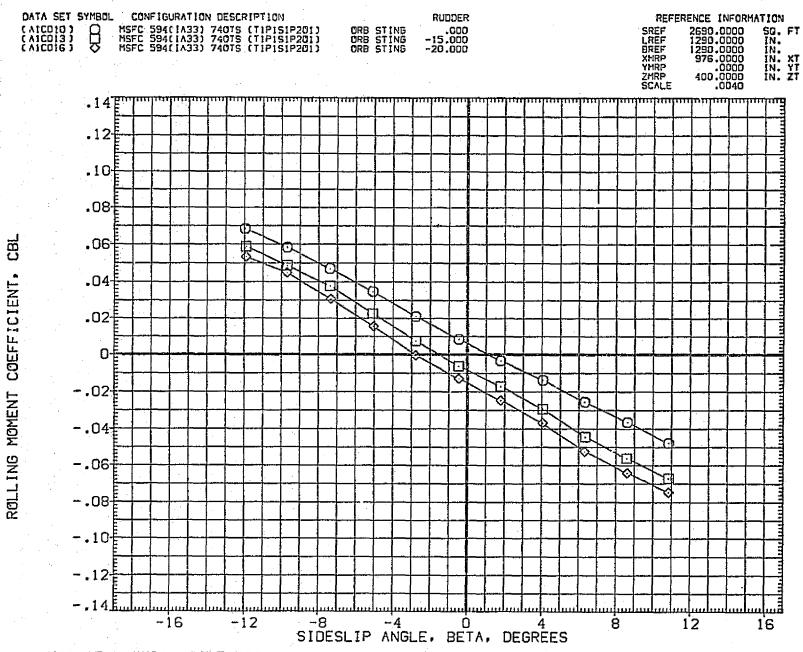
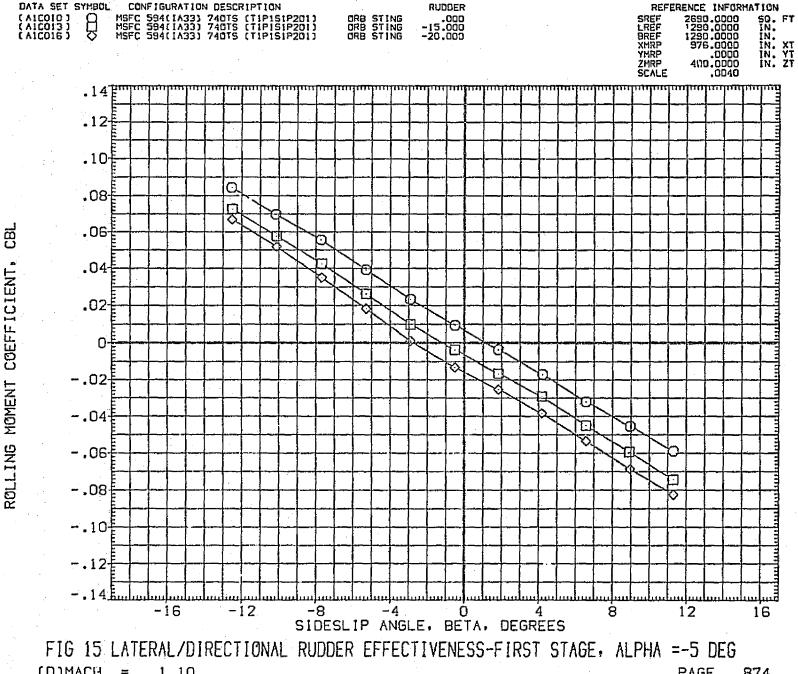


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

COMACH = .90

PAGE 873



CDOMACH = 1.10 PAGE 874

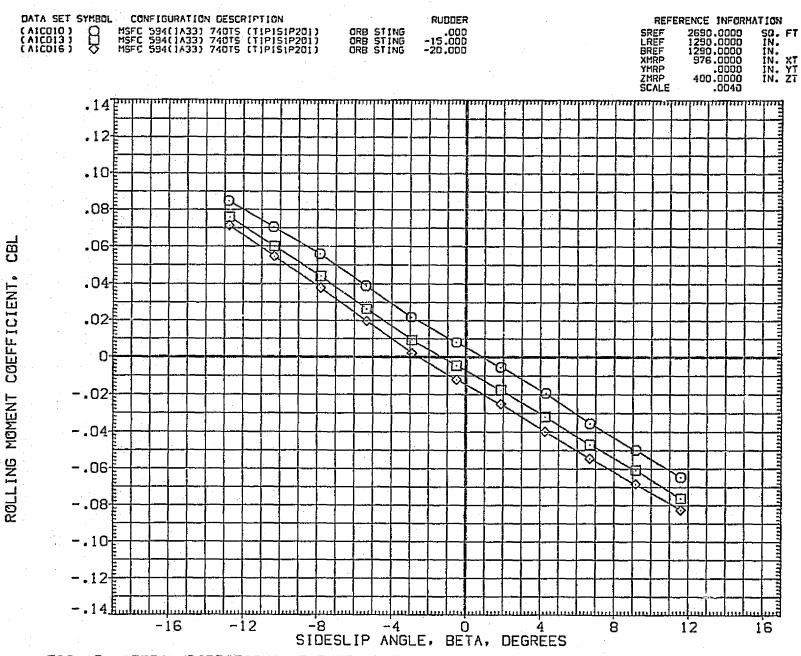


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

(E)MACH = 1.25

FAGE 875

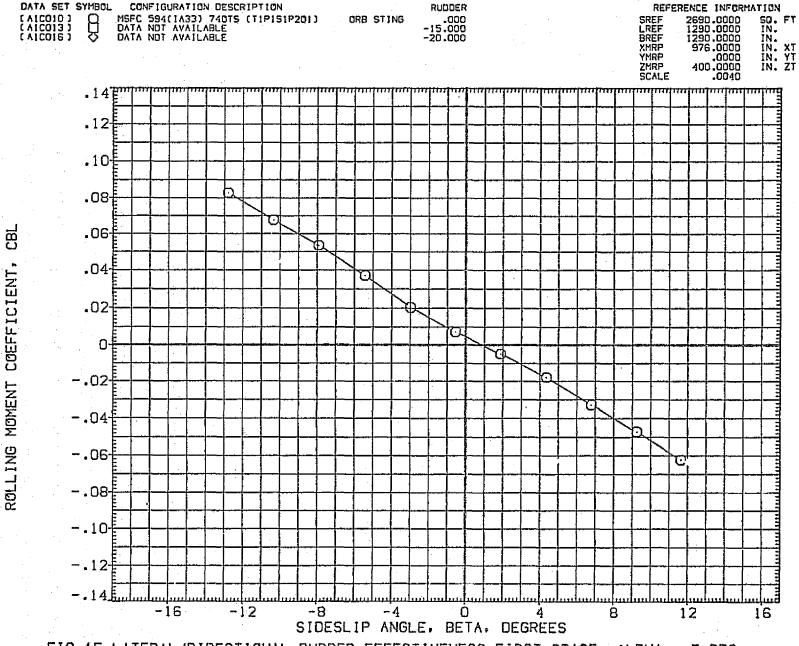


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

(F)MACH = 1.46

PAGE 876

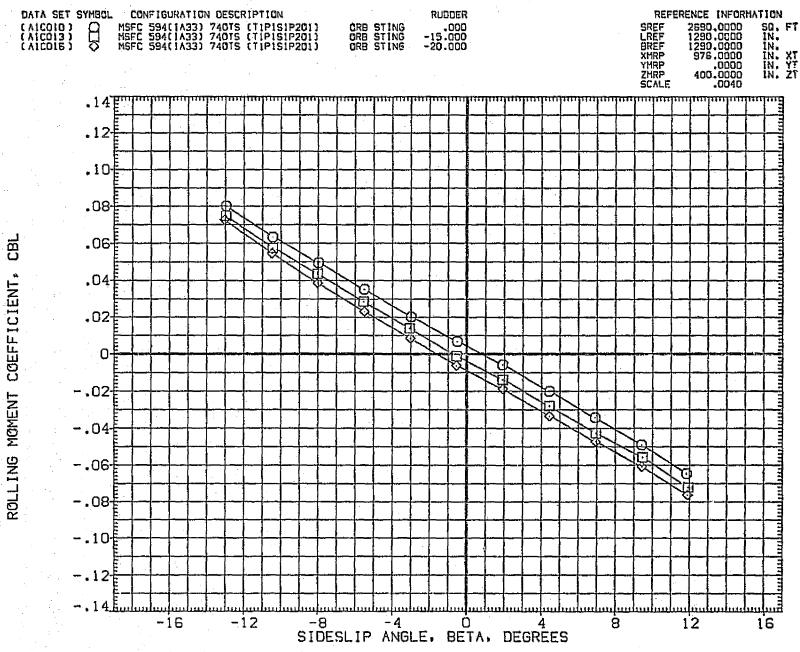


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

CGDMACH = 1.97

PAGE 877

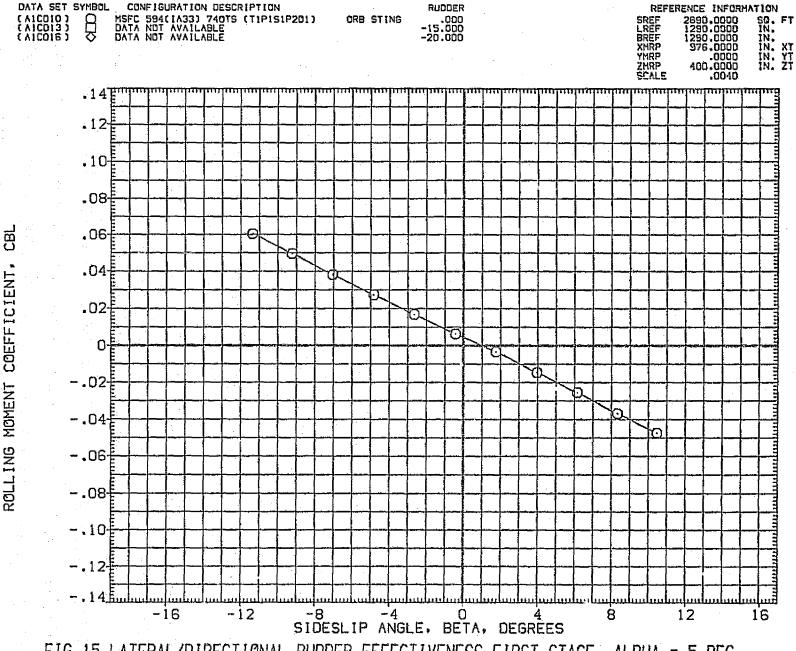


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG
(H)MACH = 2.99
PAGE 878

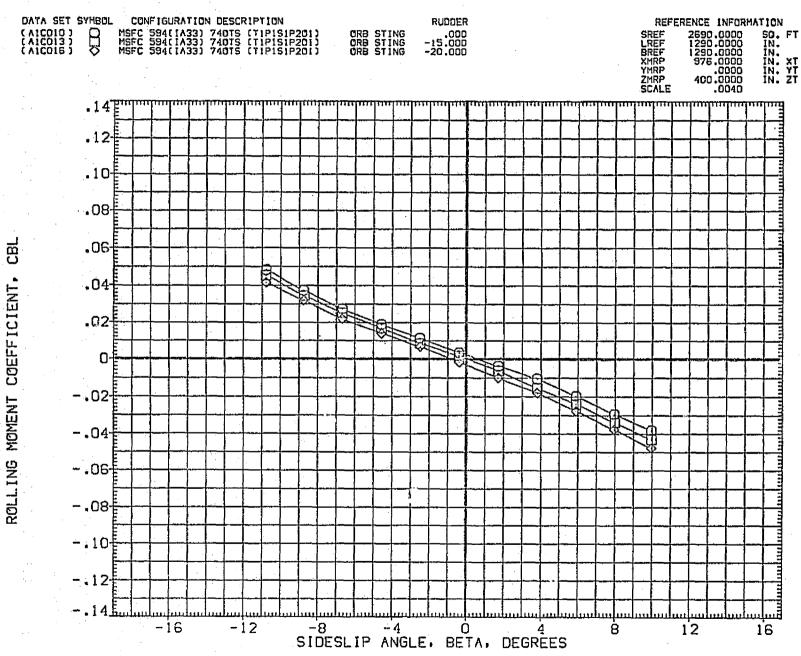
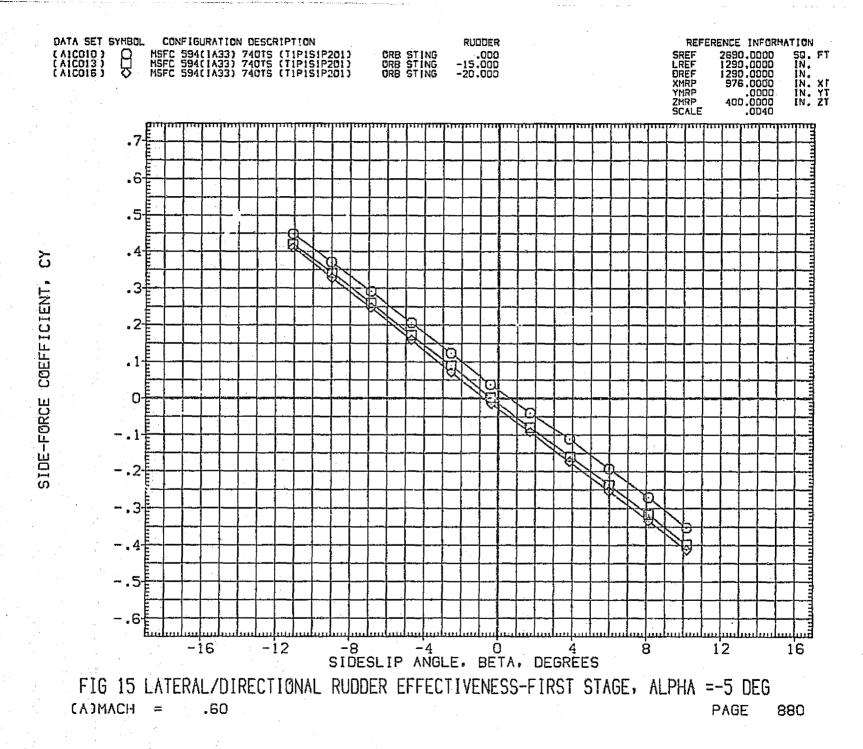


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

CIDMACH = 4.96

PAGE 879



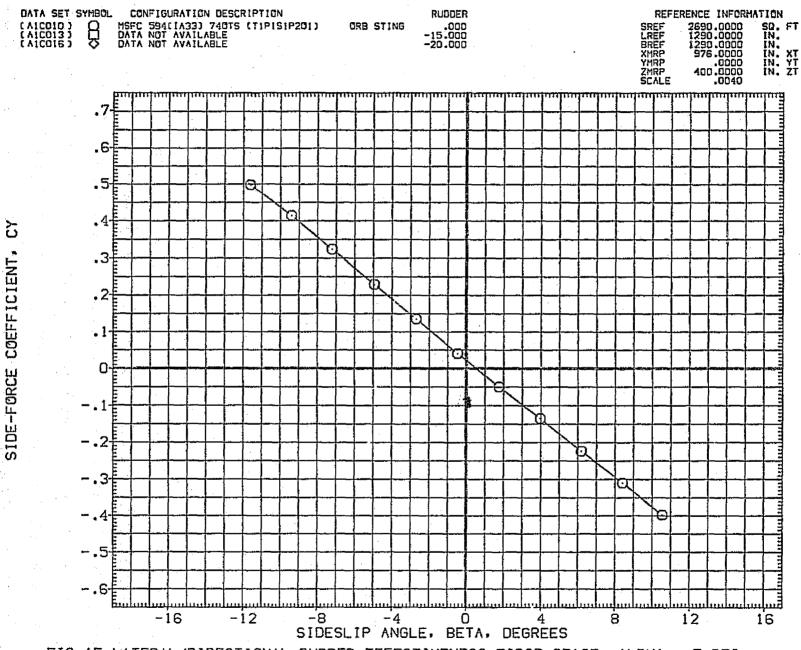


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

(B)MACH = .80

PAGE 881

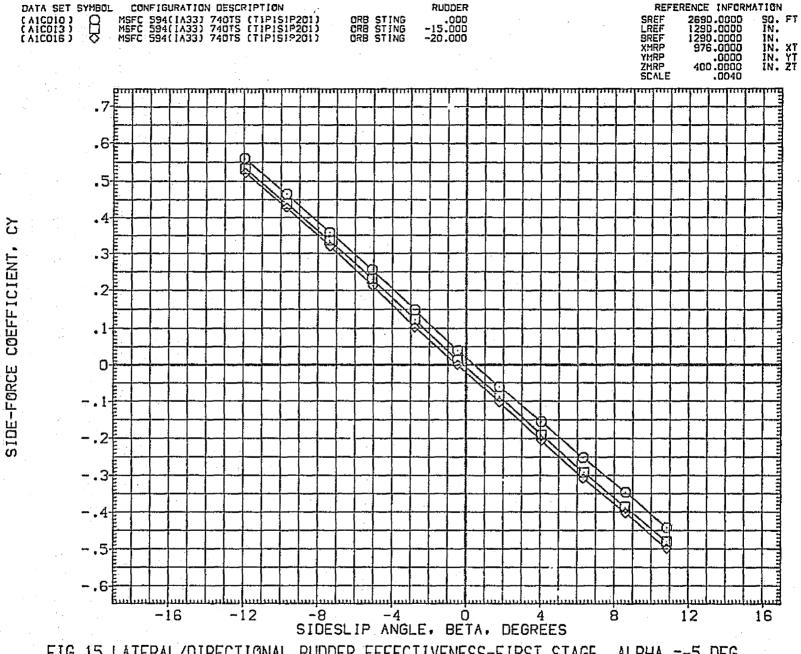


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG
(C)MACH = .90

PAGE 882

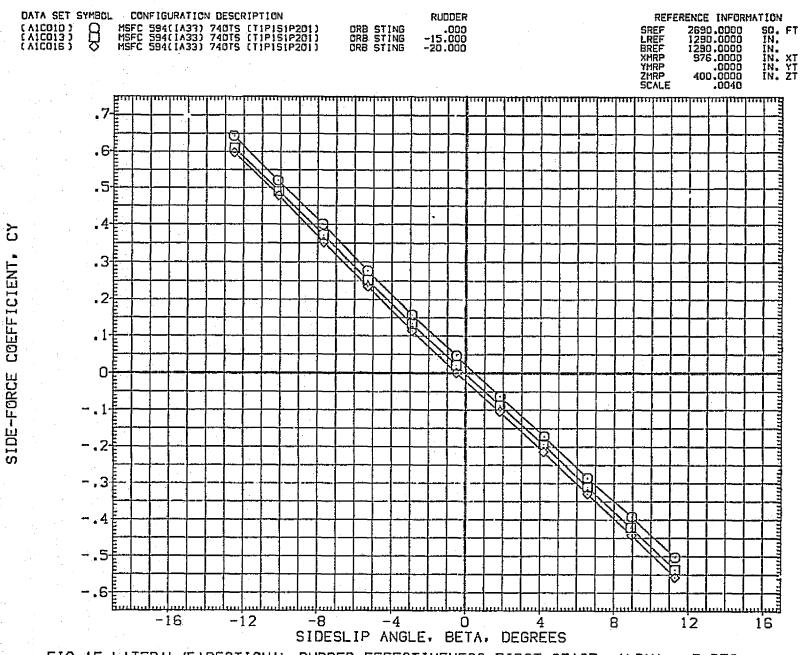


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

CD)MACH = 1.10

PAGE 883

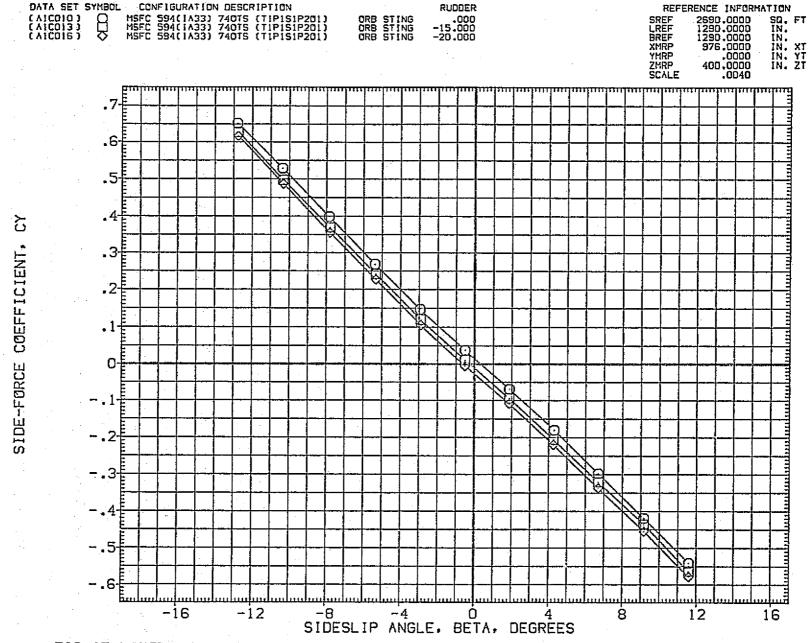


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

LEDMACH = 1.25

PAGE 884

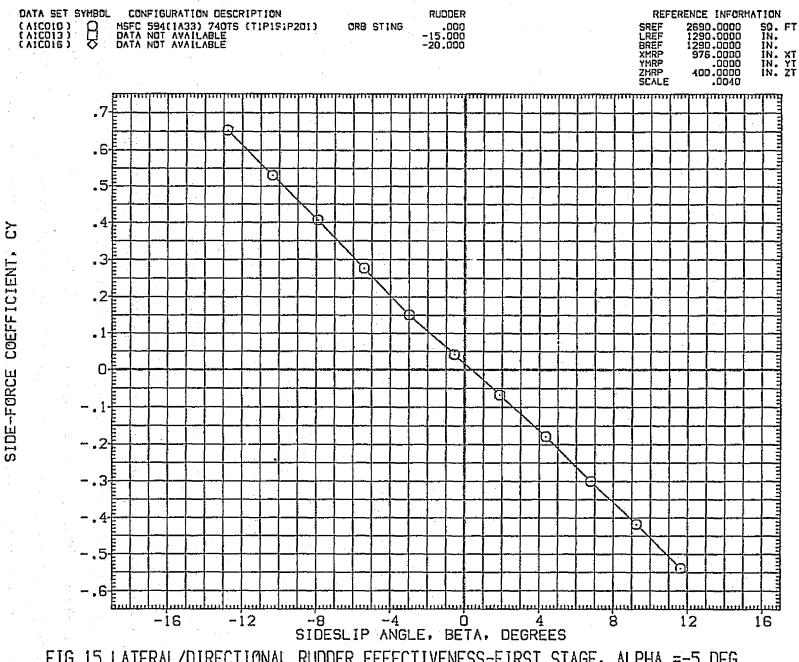


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

(F)MACH = 1.46

PAGE 885

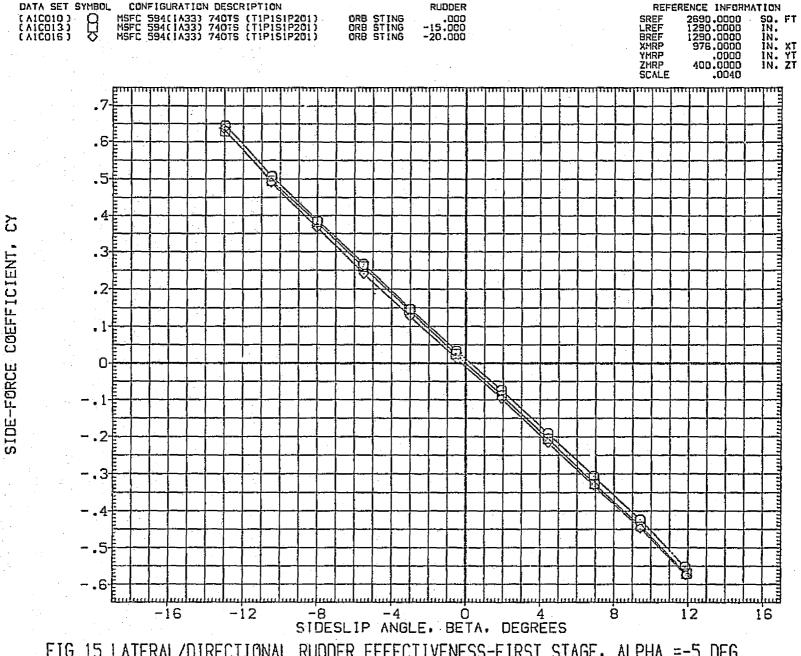


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

(G)MACH = 1.97

PAGE 886

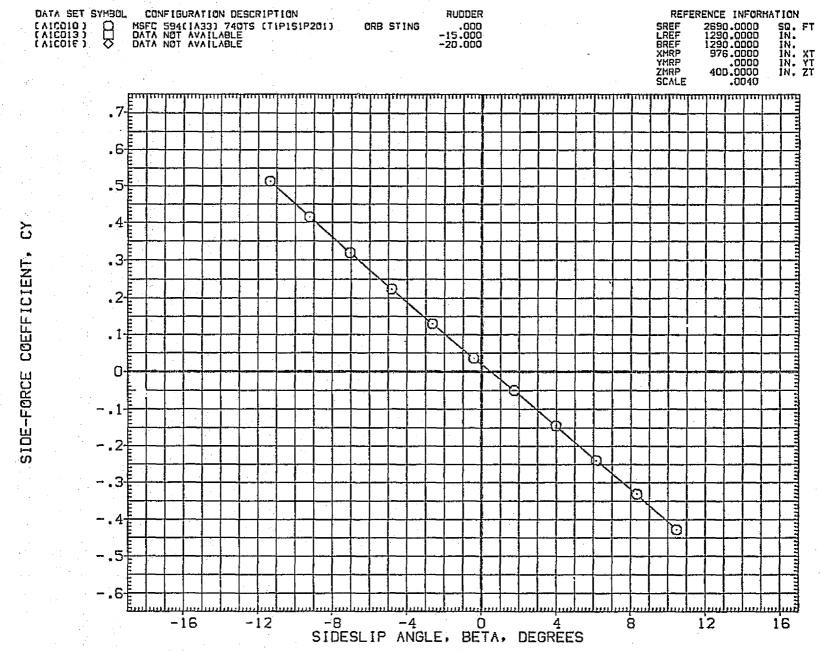
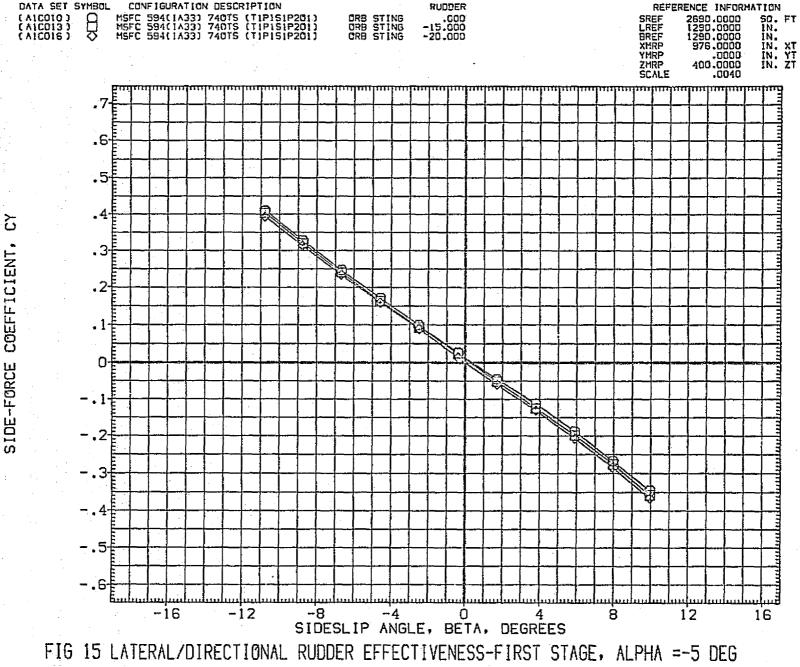


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG
(H)MACH = 2.99
PAGE 887



CIDMACH = PAGE 888

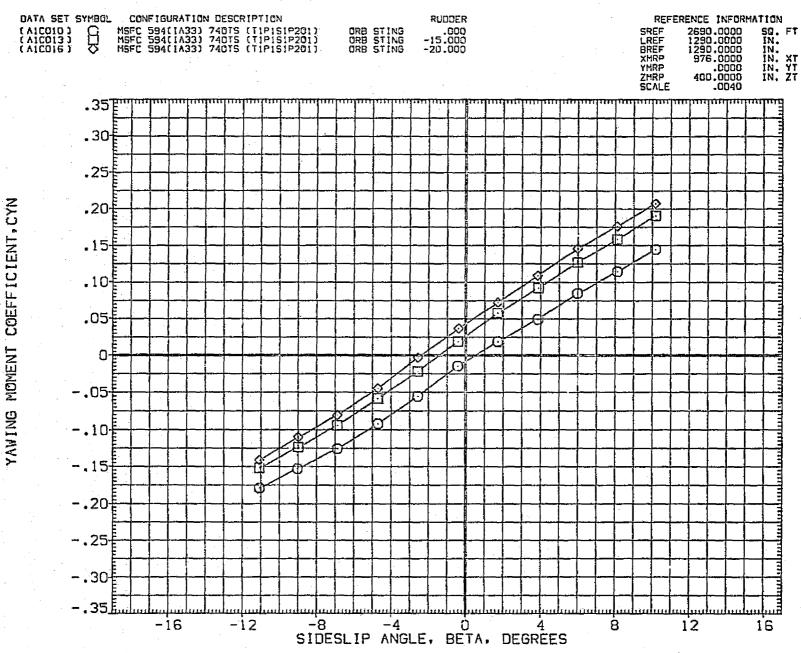
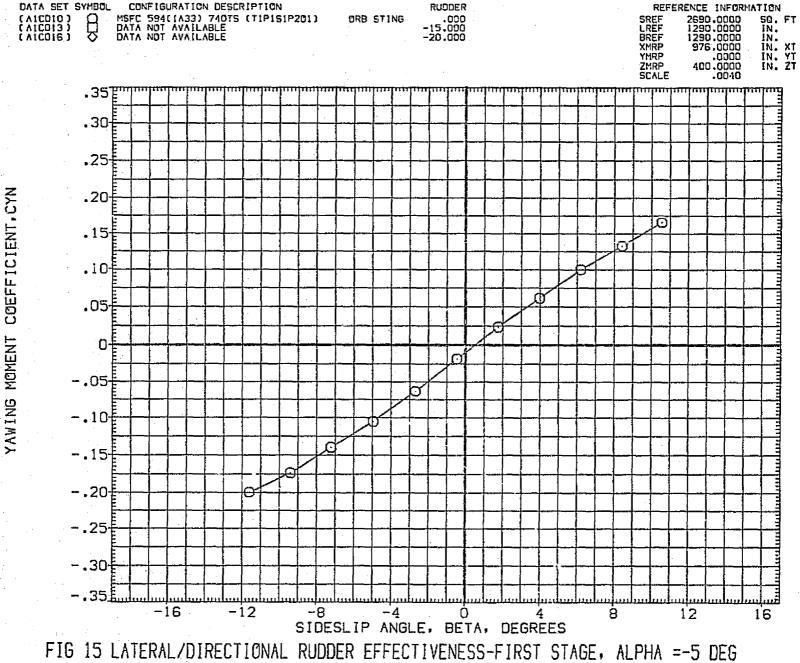


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

(A)MACH = .60

PAGE 889



(B)MACH = PAGE 890

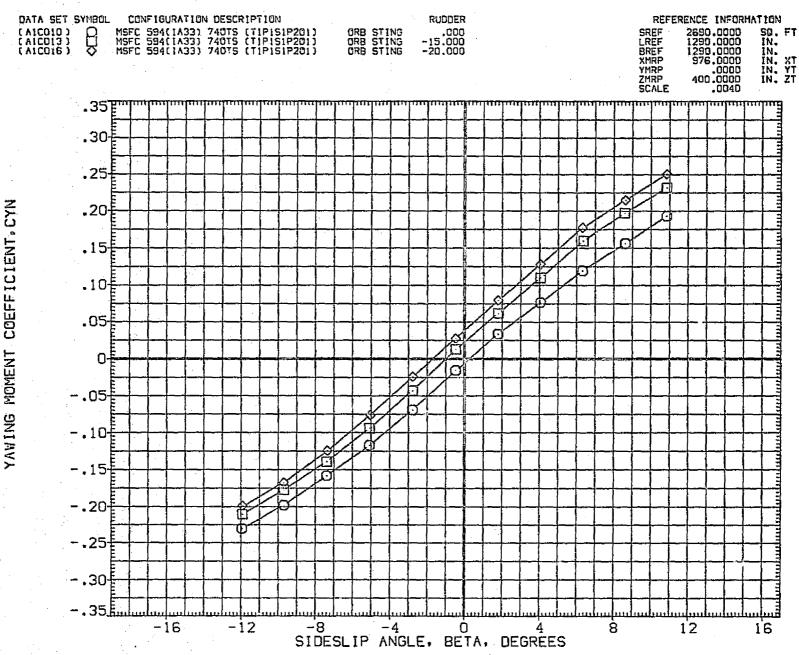
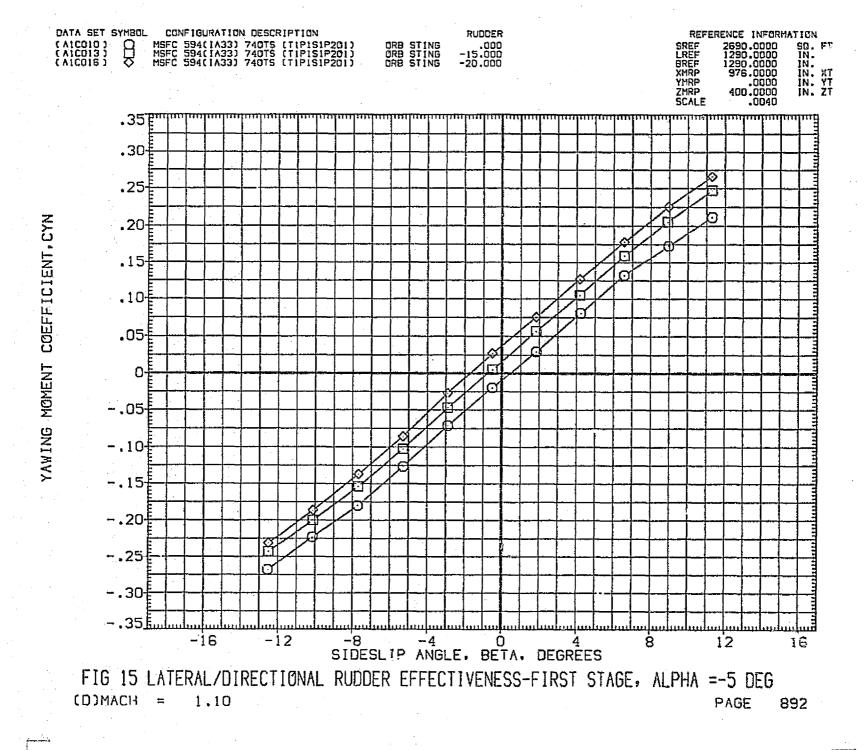
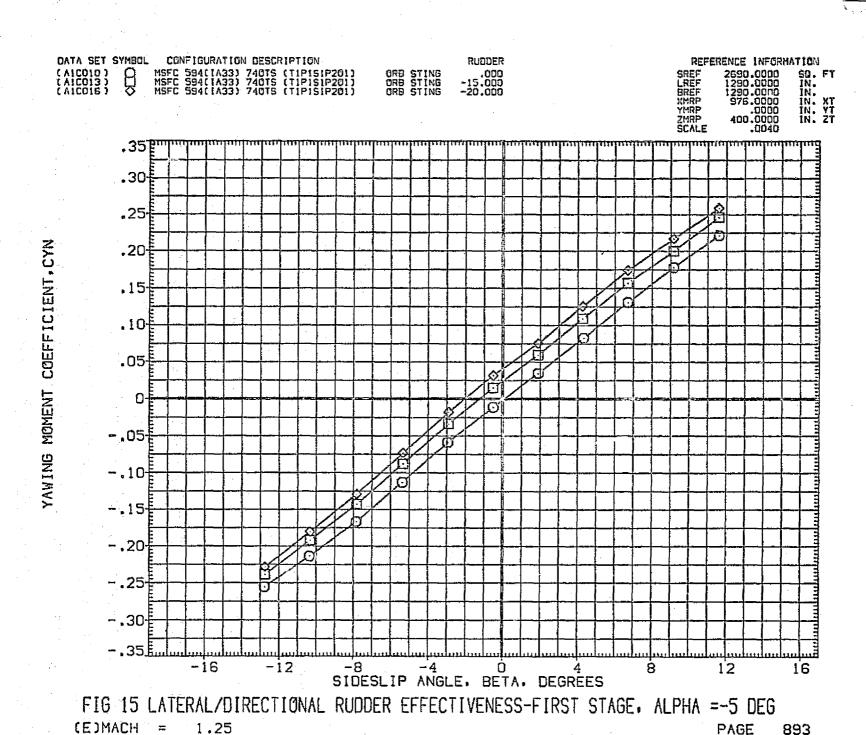


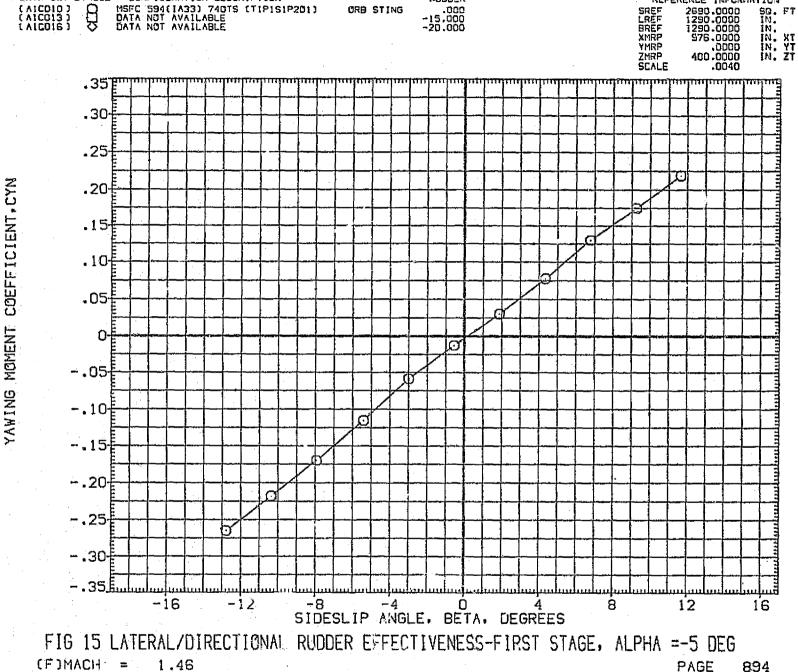
FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

(C)MACH = .90

PAGE 891







RUDDER

REFERENCE INFORMATION

DATA SET SYMBOL CONFIGURATION GESCRIPTION

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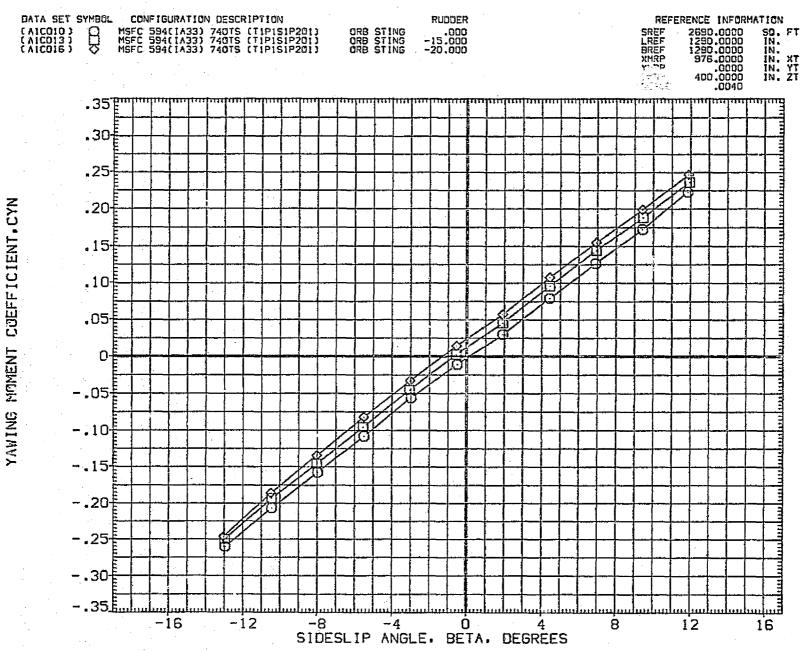


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

(G)MACH = 1.97

PAGE 895

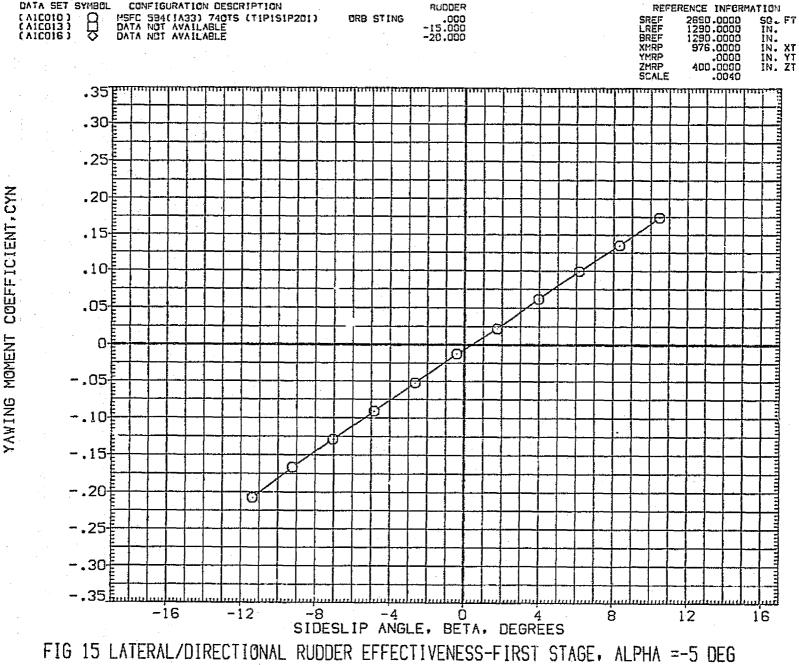


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE. ALPHA =-5 DEG

(H)MACH = 2.99

PAGE 896

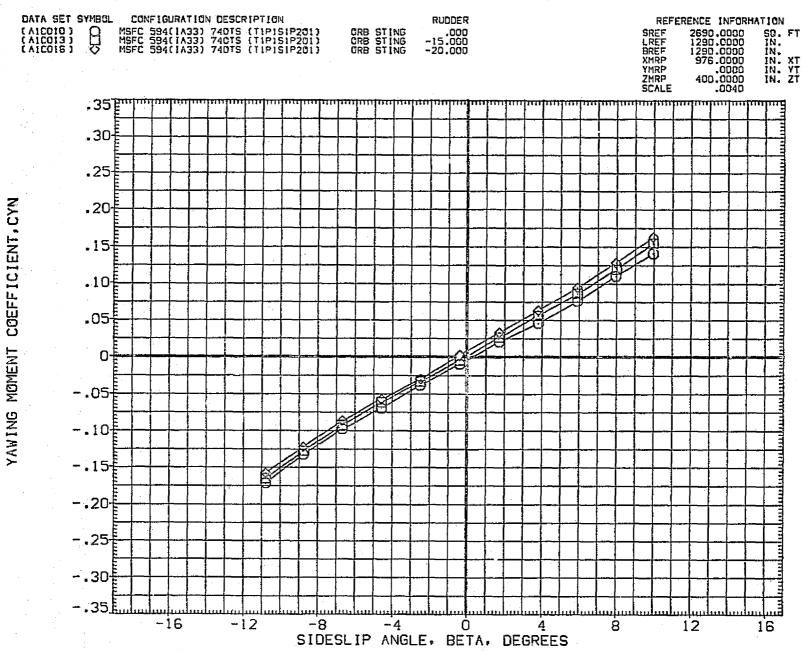


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE. ALPHA =-5 DEG

CIDMACH = 4.96

PAGE 897

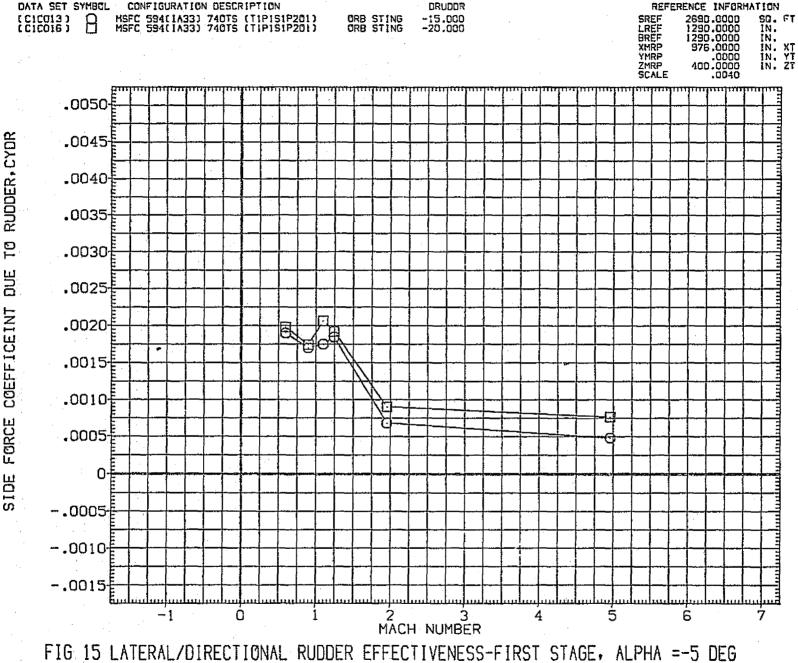
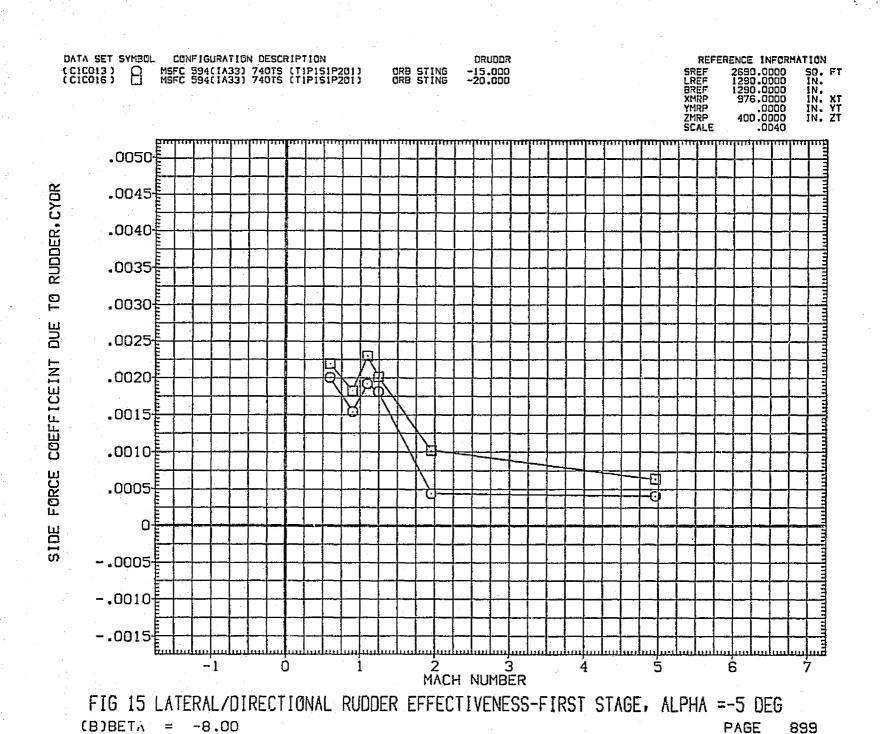
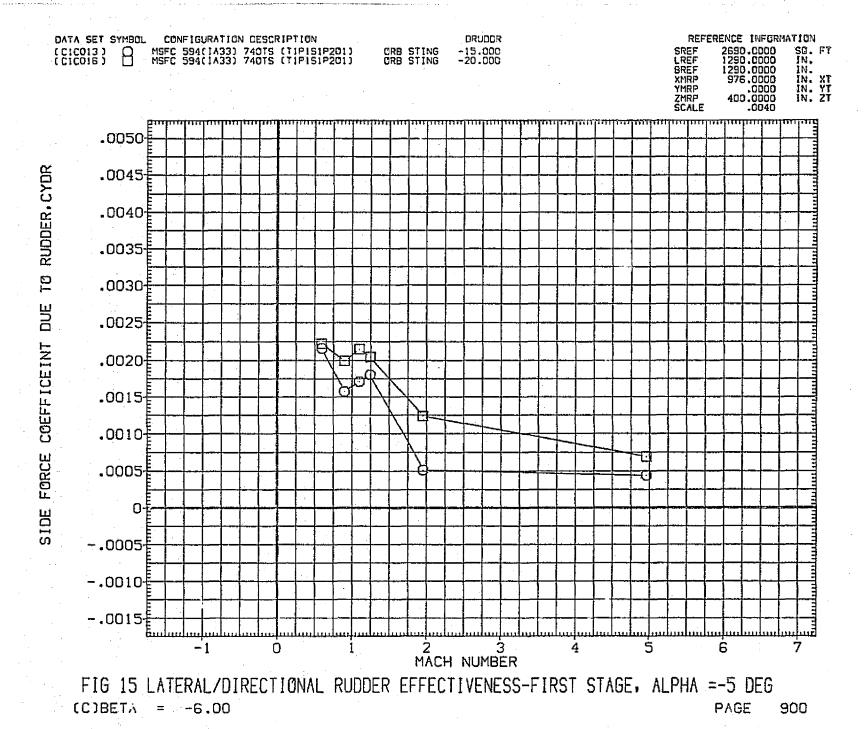


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

(A)BETA = -10.00

PAGE 898





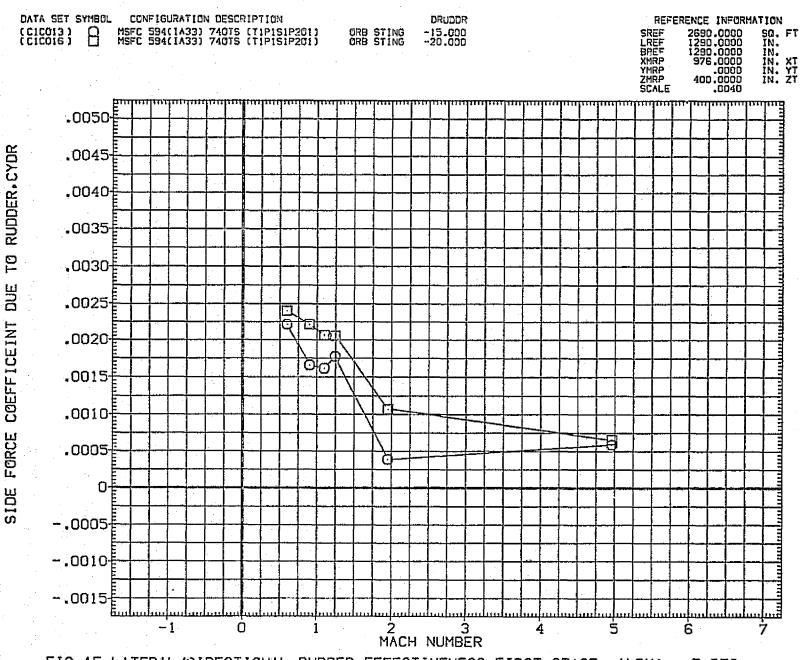


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

(D)BETA = -4.00

PAGE 901

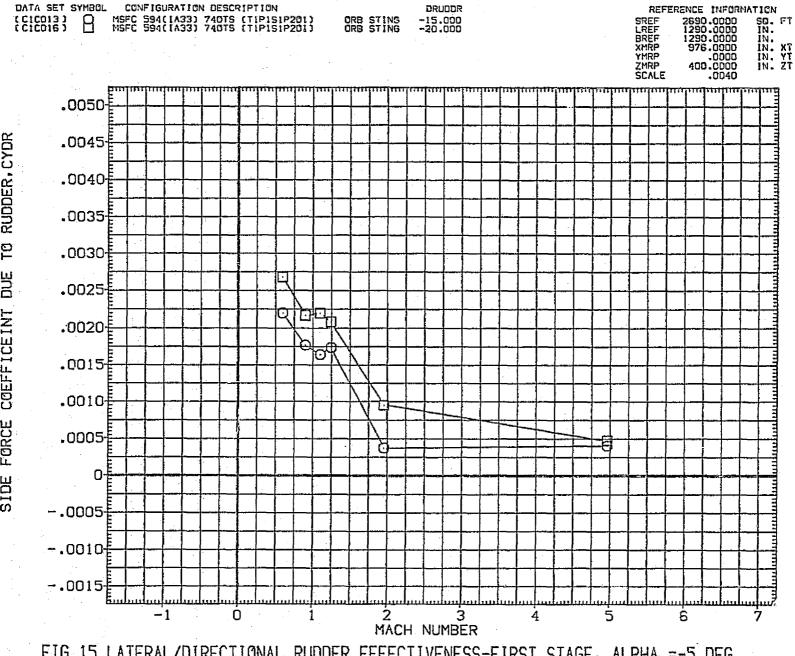
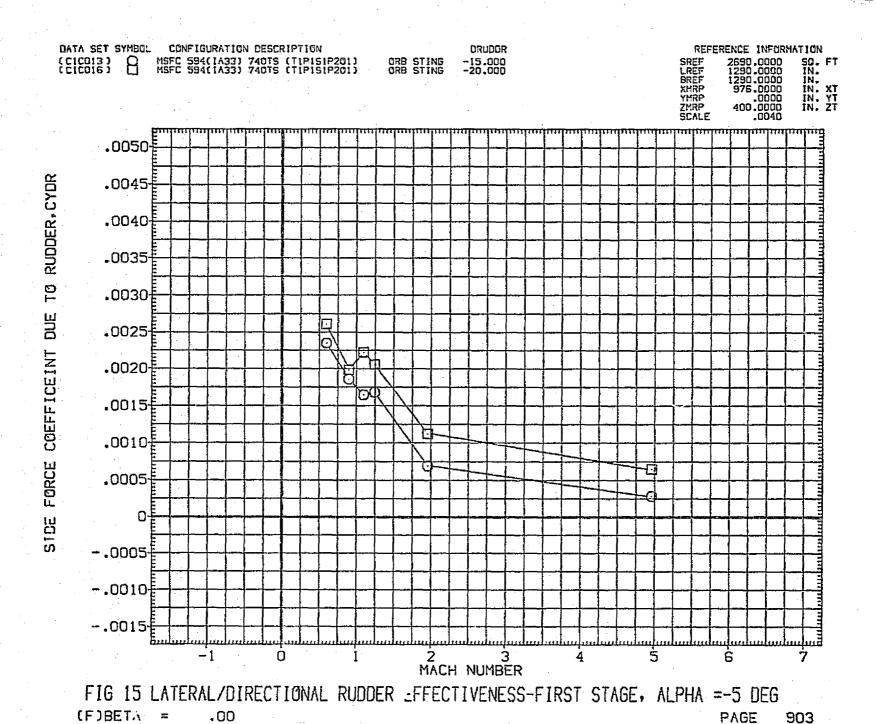
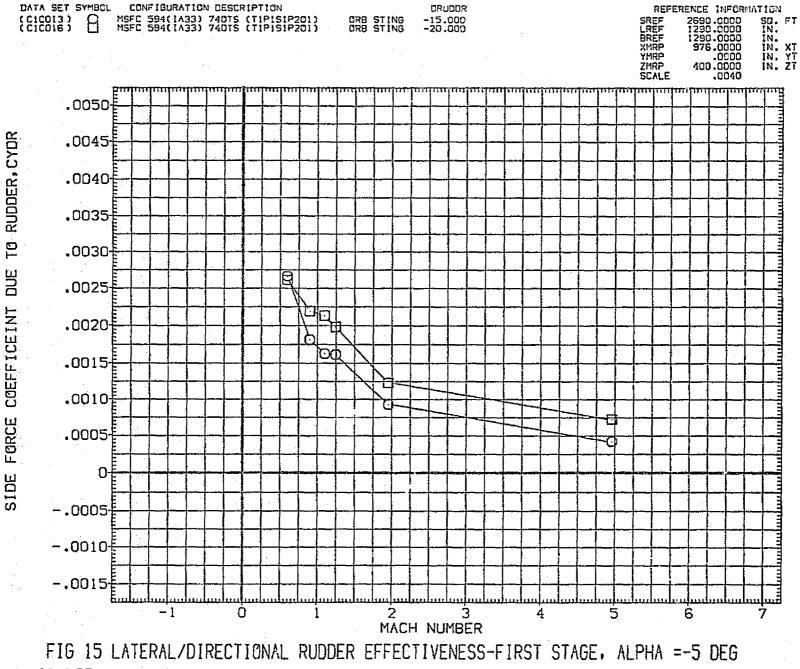
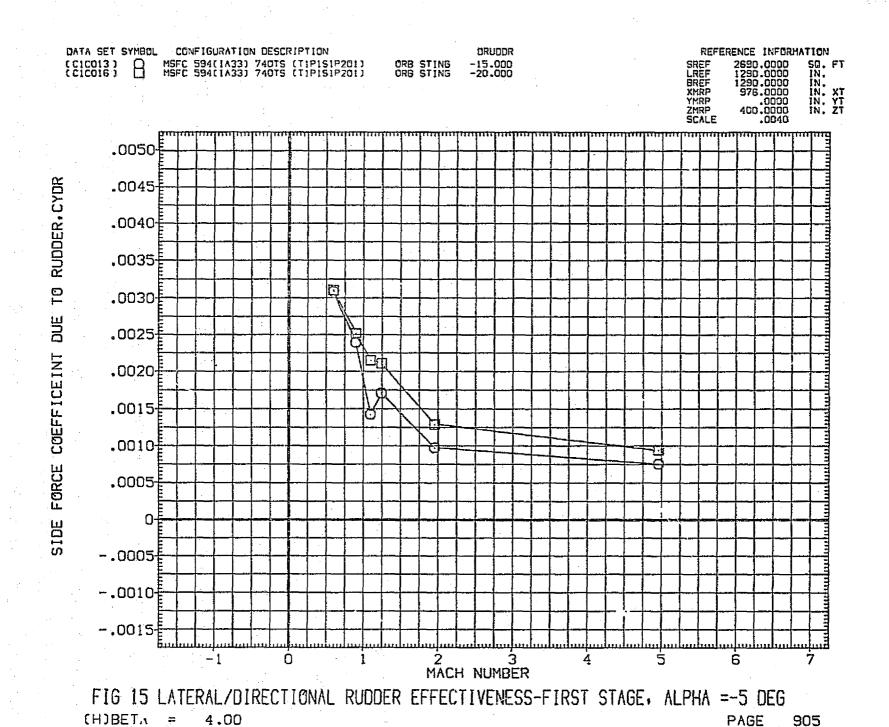


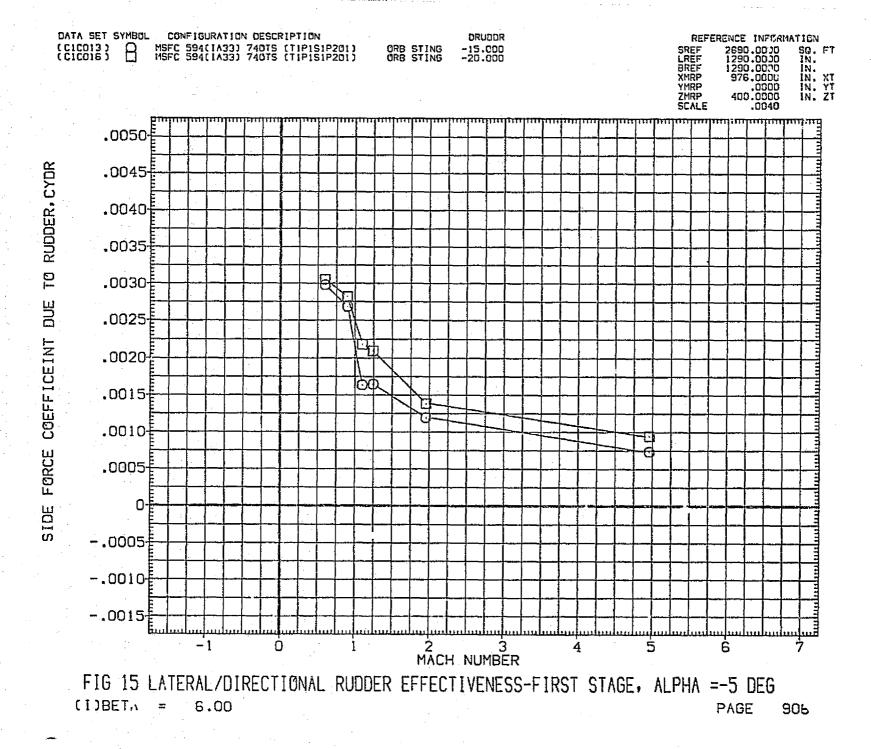
FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG
(E)BETA = -2.00
PAGE 902





 $(G)BET_A = 2.00$ PAGE 904





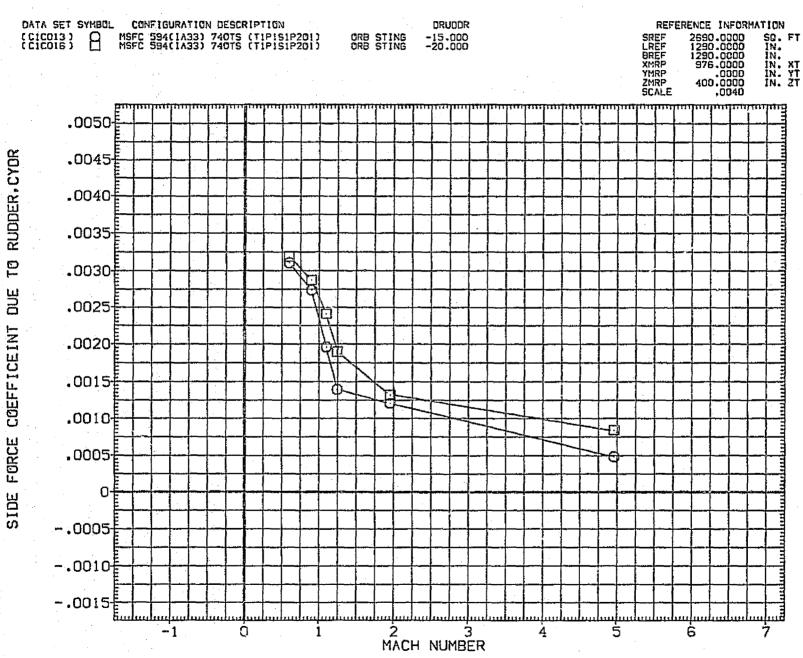
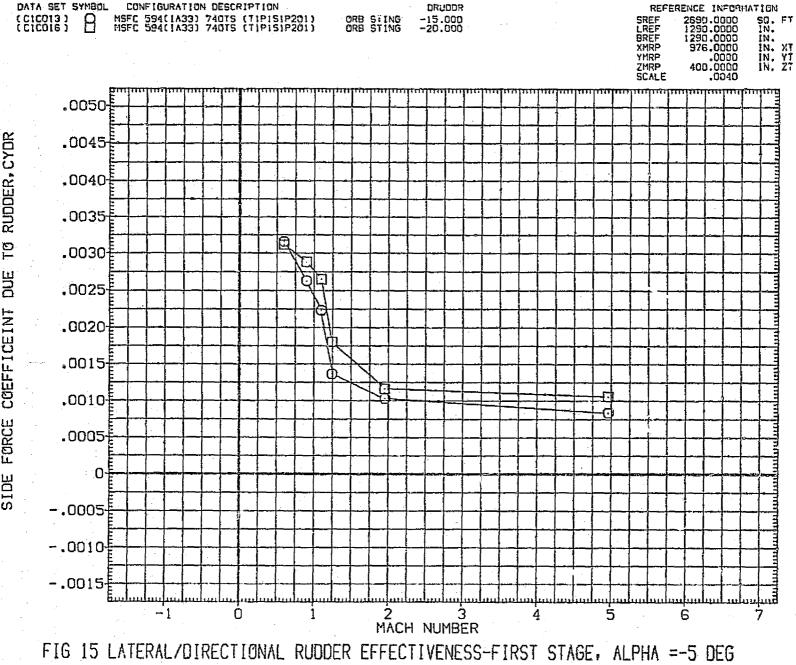


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG
(J)BETA = 8.00
PAGE

907



(K)BETA = 10.00PAGE 908

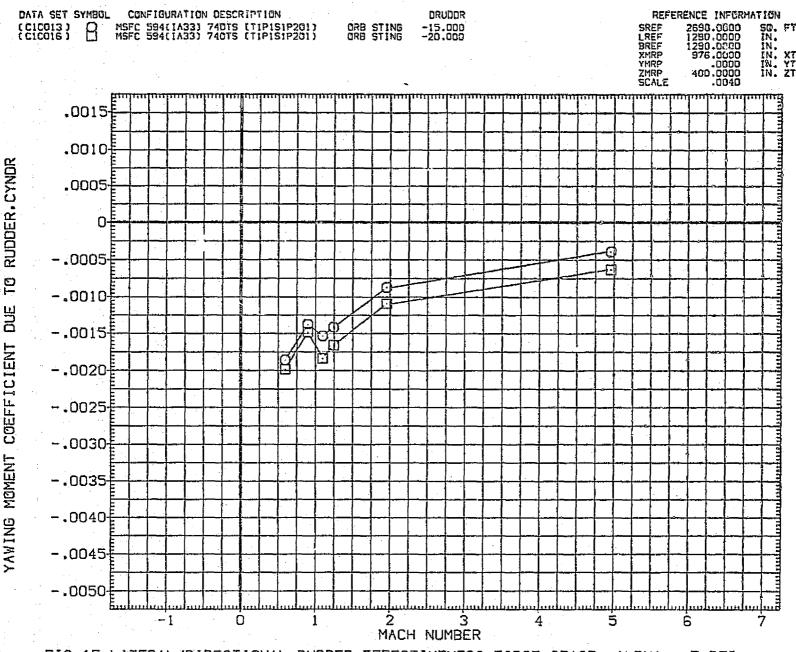
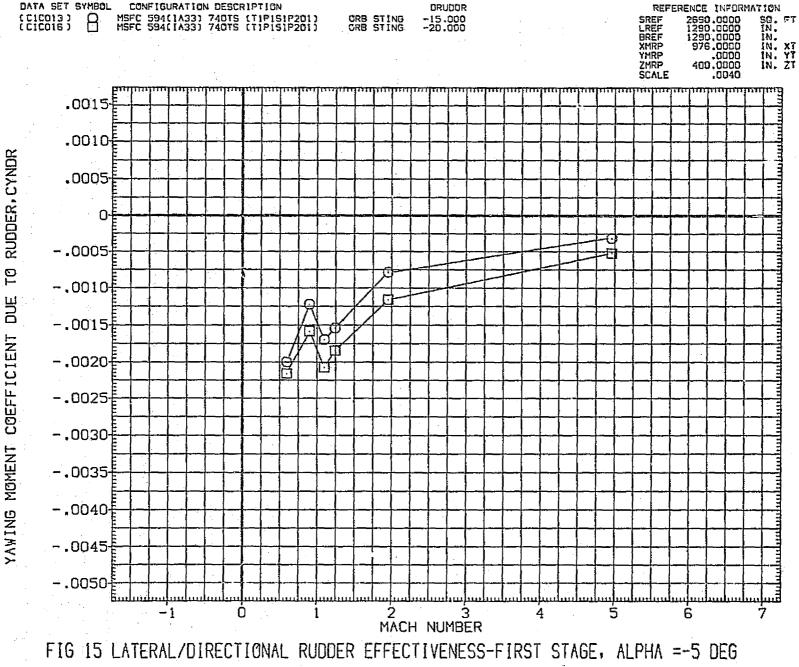


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

(A)BETA = -10.00

PAGE 909



(B)BET $\Lambda = -8.00$ PAGE 910

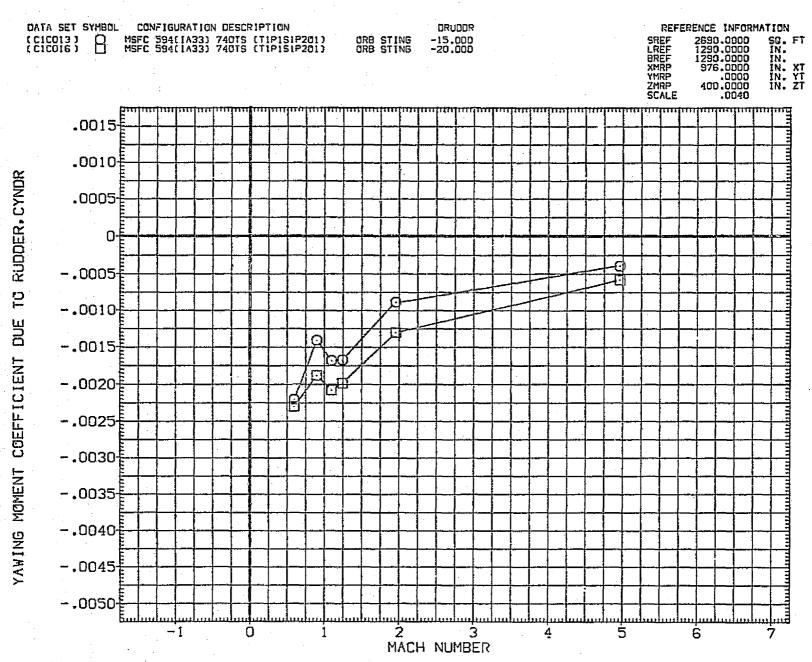


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

(C)BETA = -6.00

PAGE 911

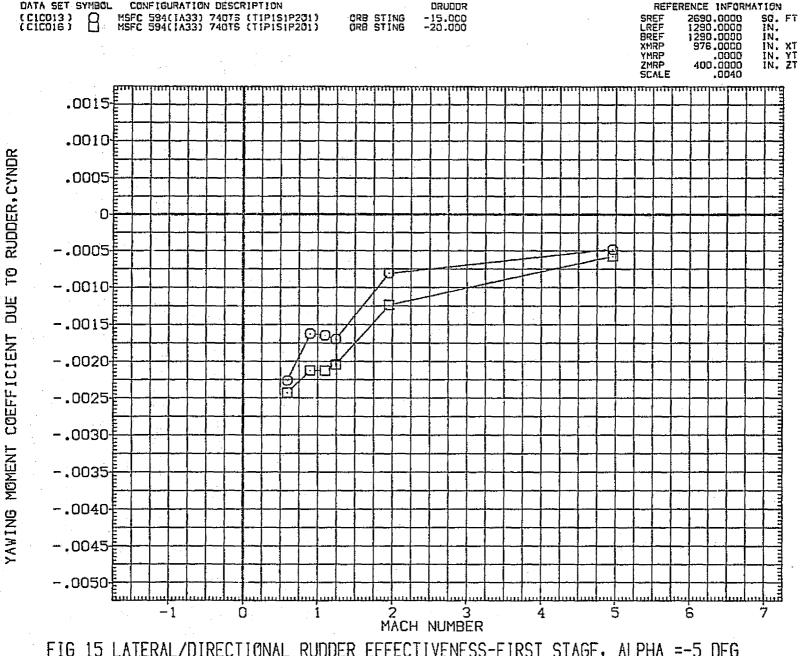


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

(D)BETA = -4.00

PAGE 912

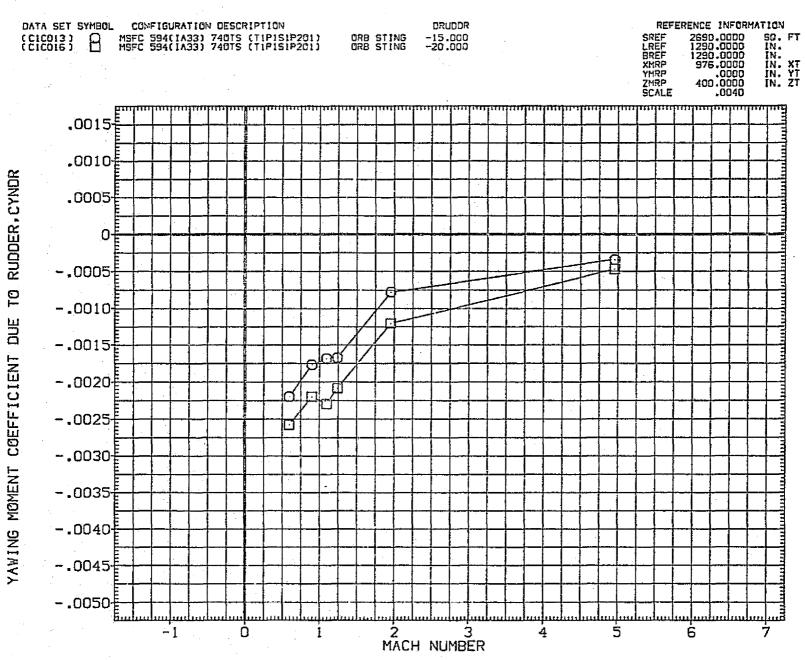


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG
(E)BETA = -2.00
PAGE 913

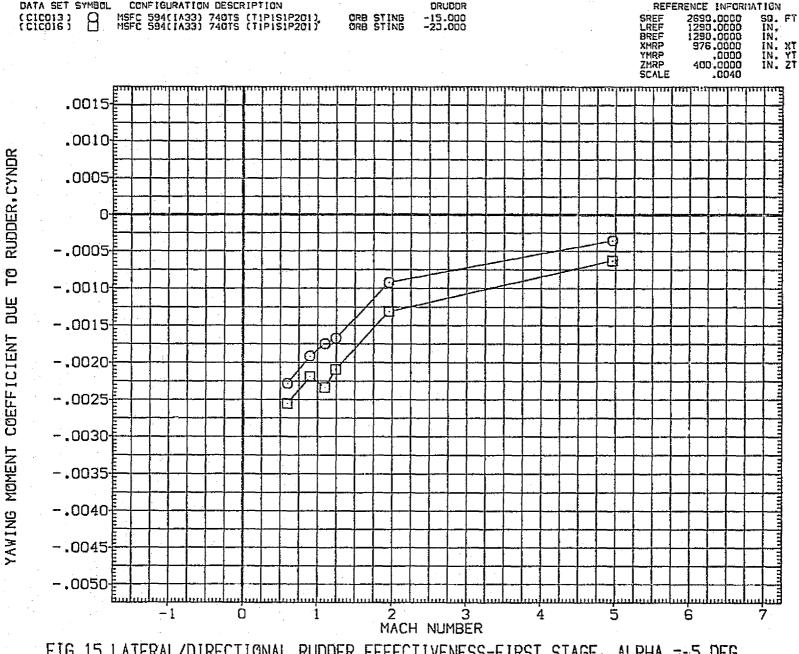


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

(F)BETA = .00

PAGE 914

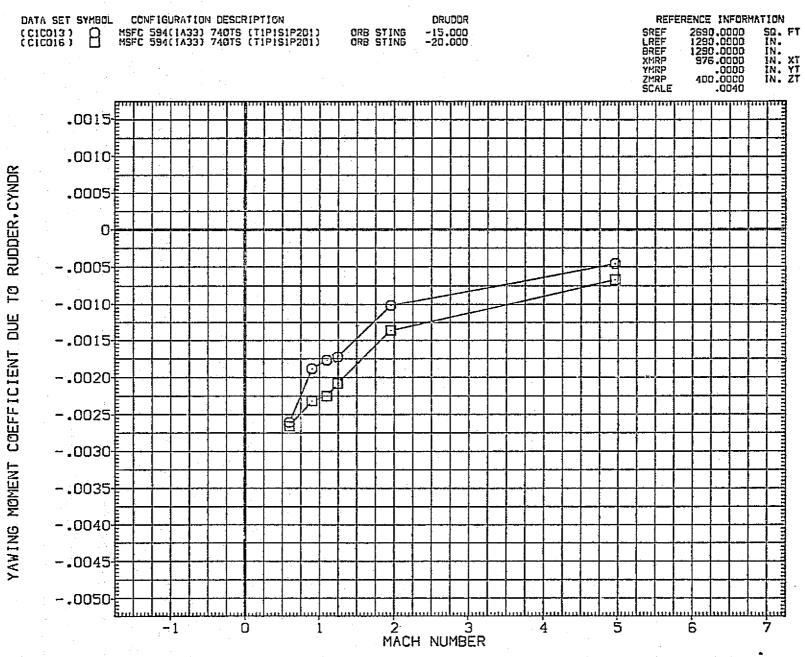


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

CGOBETA = 2.00 PAGE 915

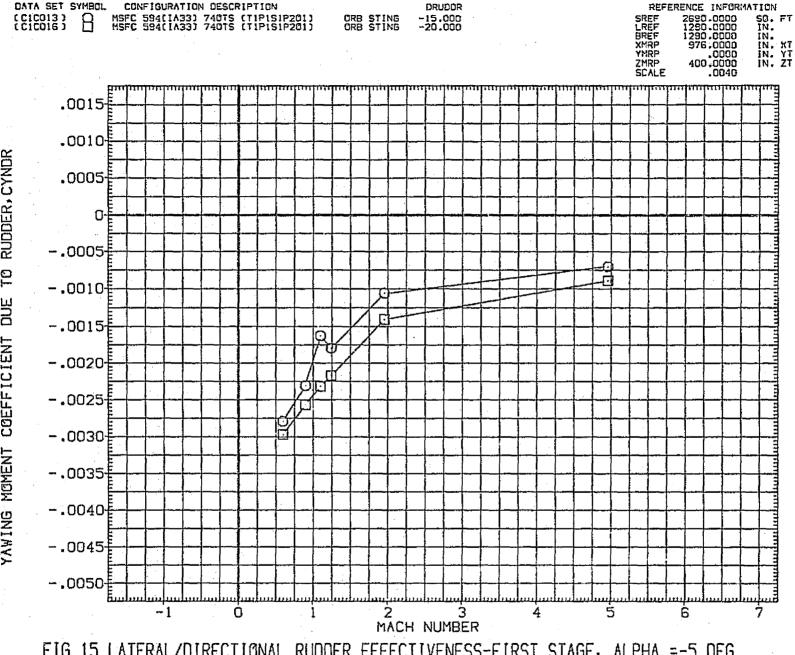


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

CHIBETA = 4.00

PAGE 916

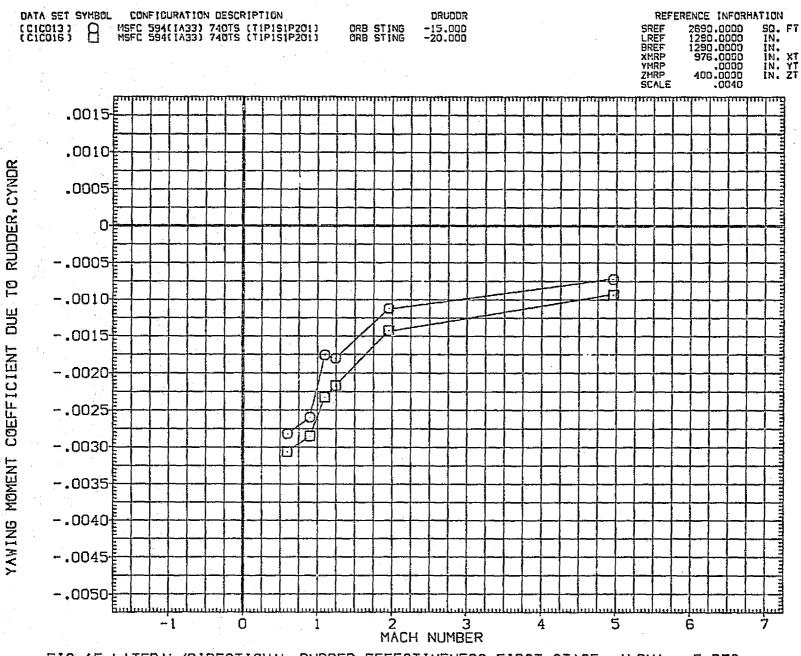


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG
(1)BETA = 6.00
PAGE 917

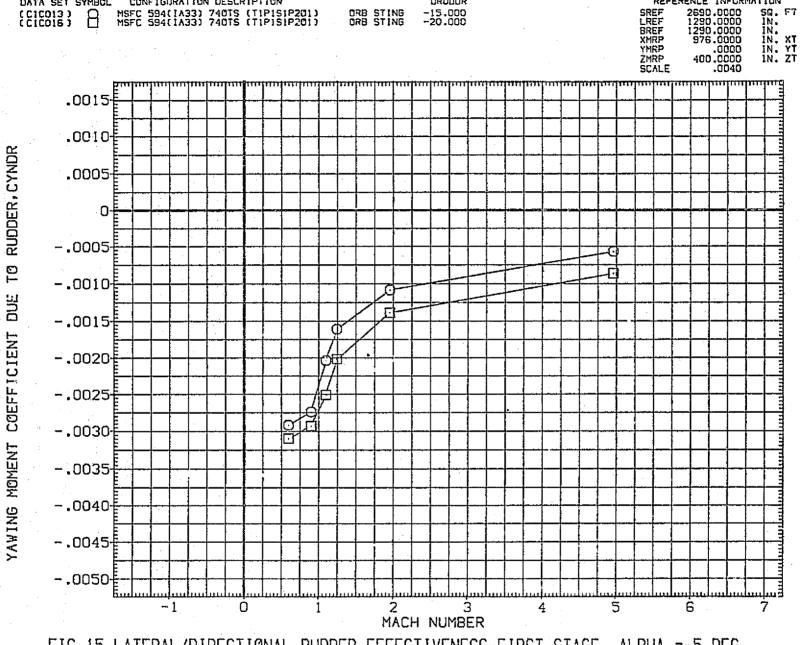


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

(J)BETA = 8.00

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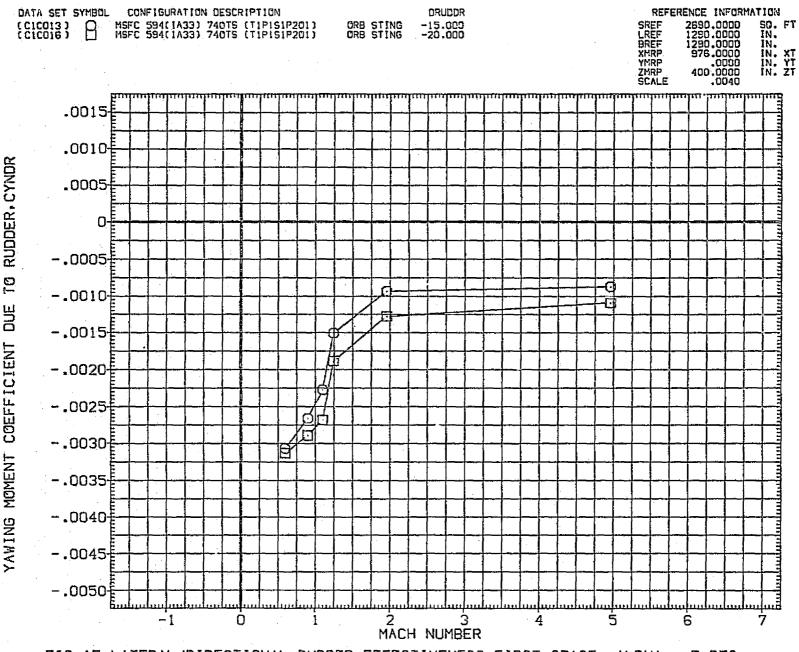
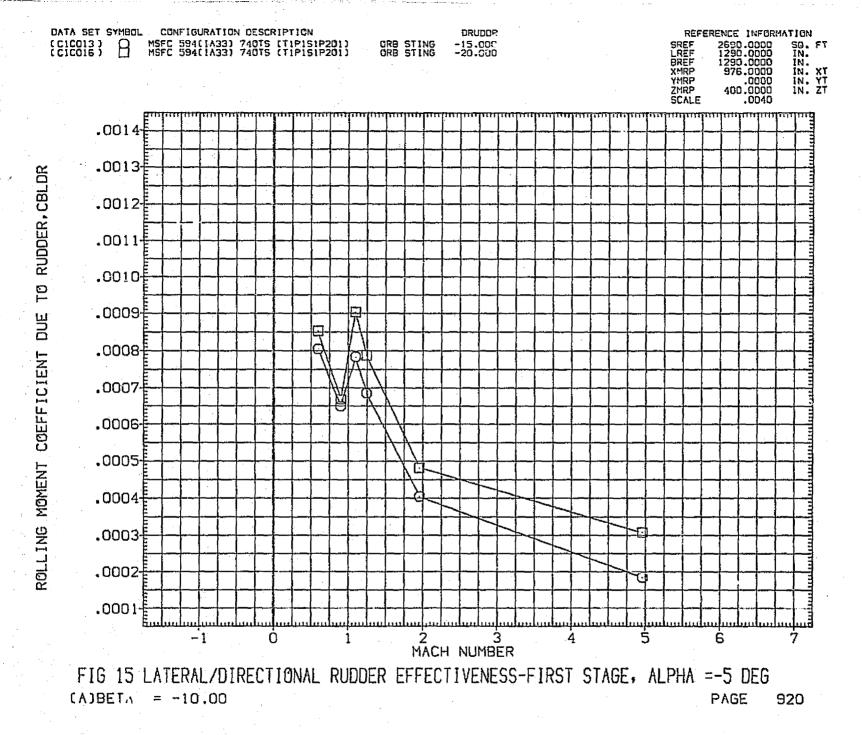


FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG
(K)BETA = 10.00 PAGE 919



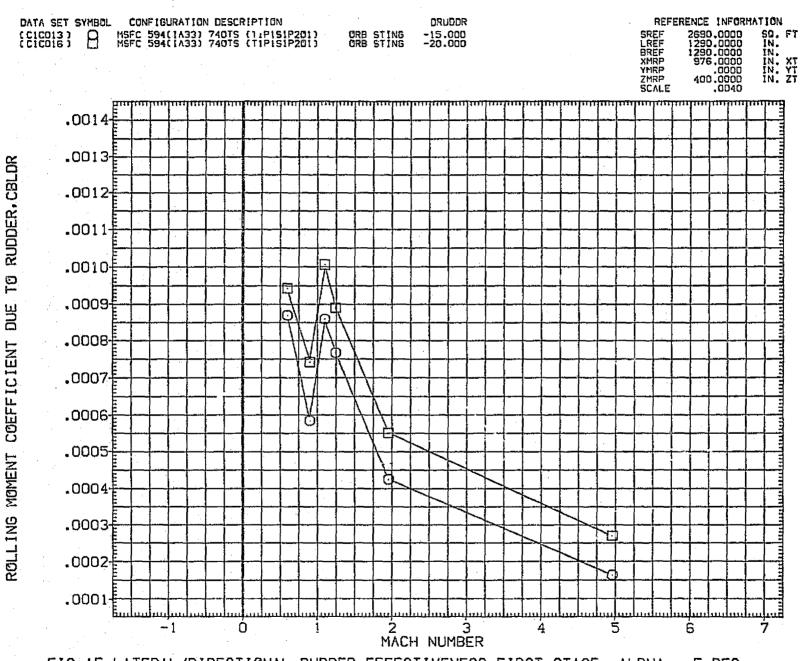
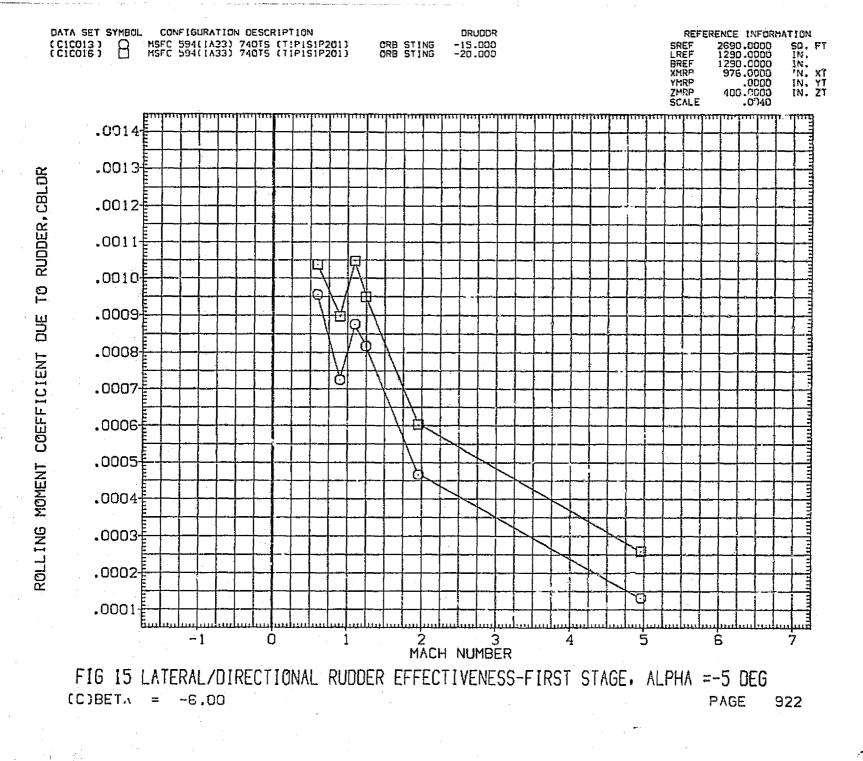
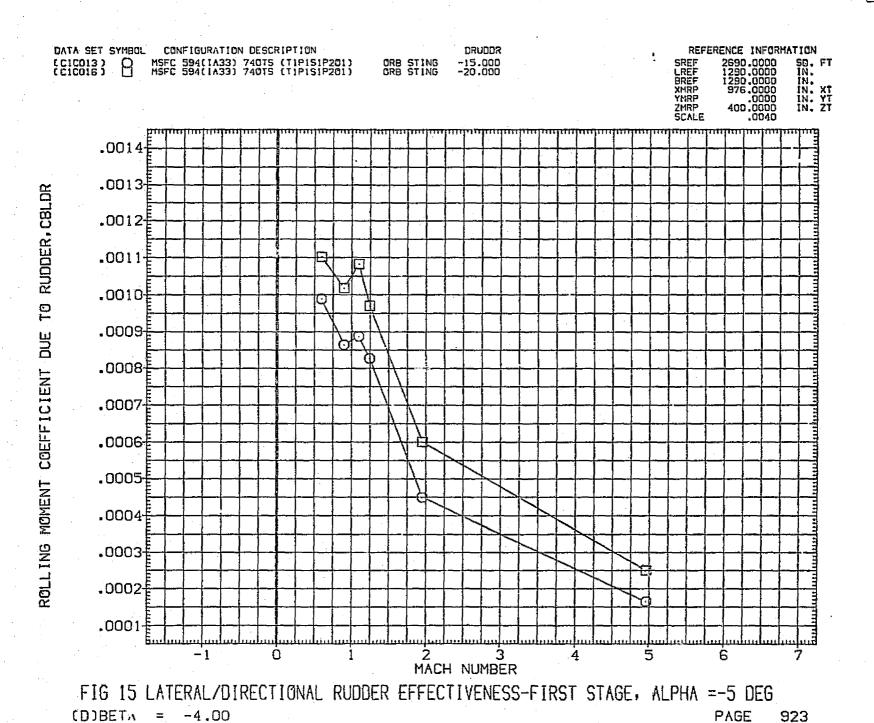


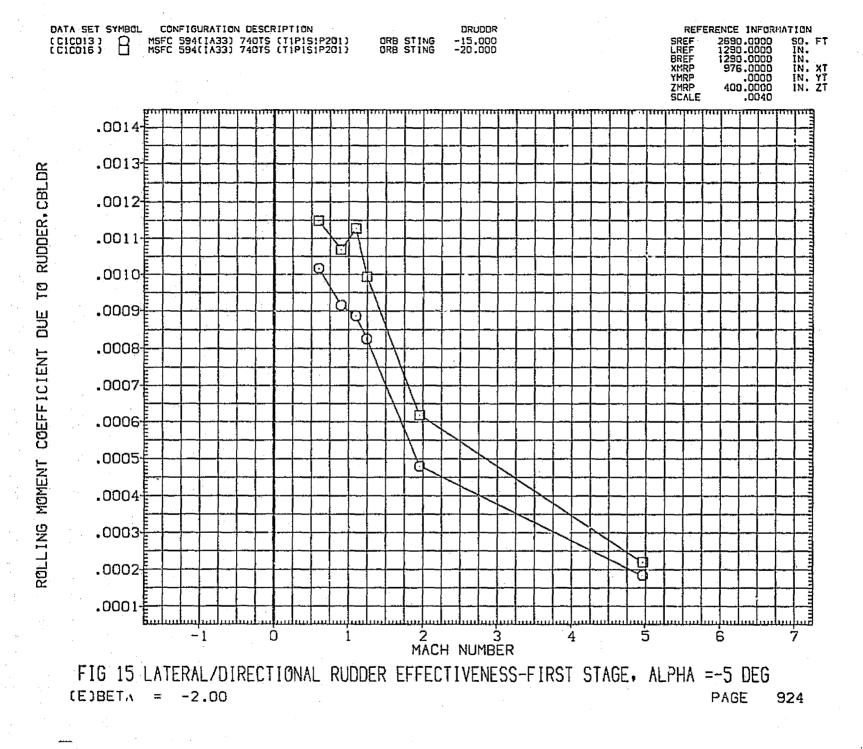
FIG 15 LATERAL/DIRECTIONAL RUDDER EFFECTIVENESS-FIRST STAGE, ALPHA =-5 DEG

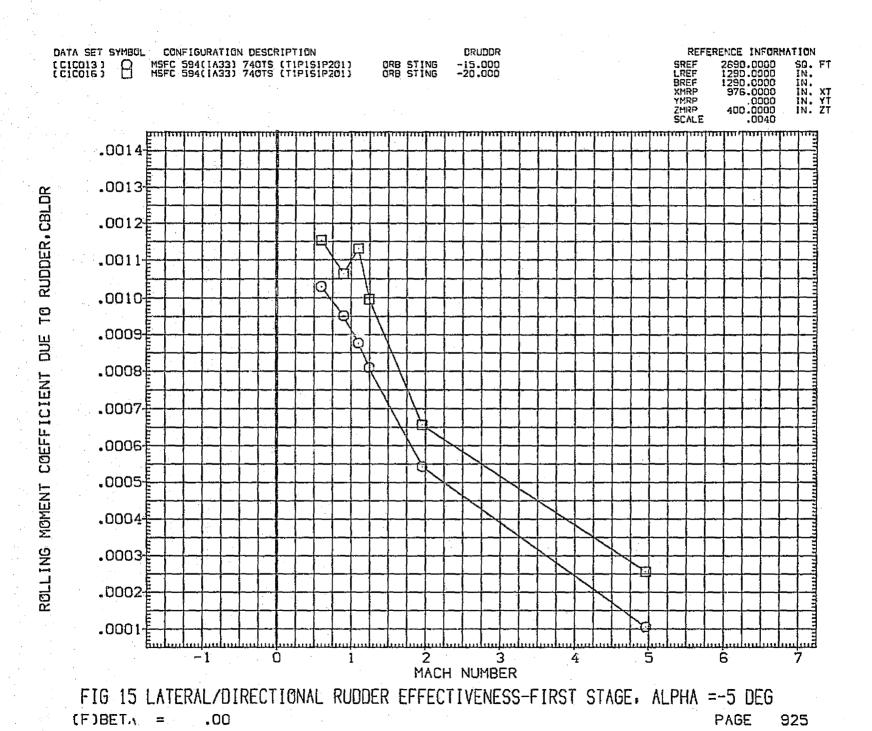
(B)BETA = -8.00

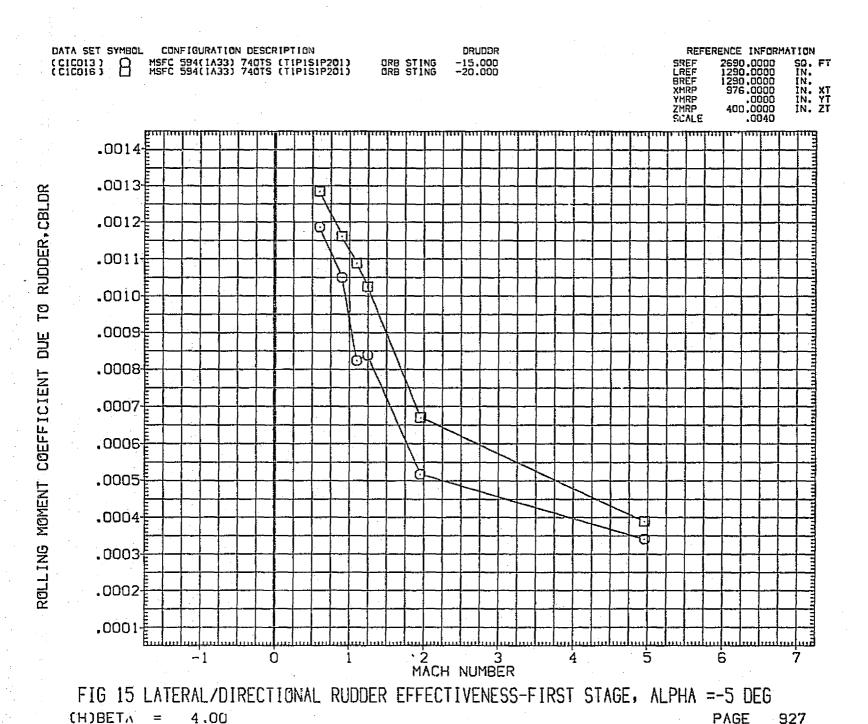
PAGE 921



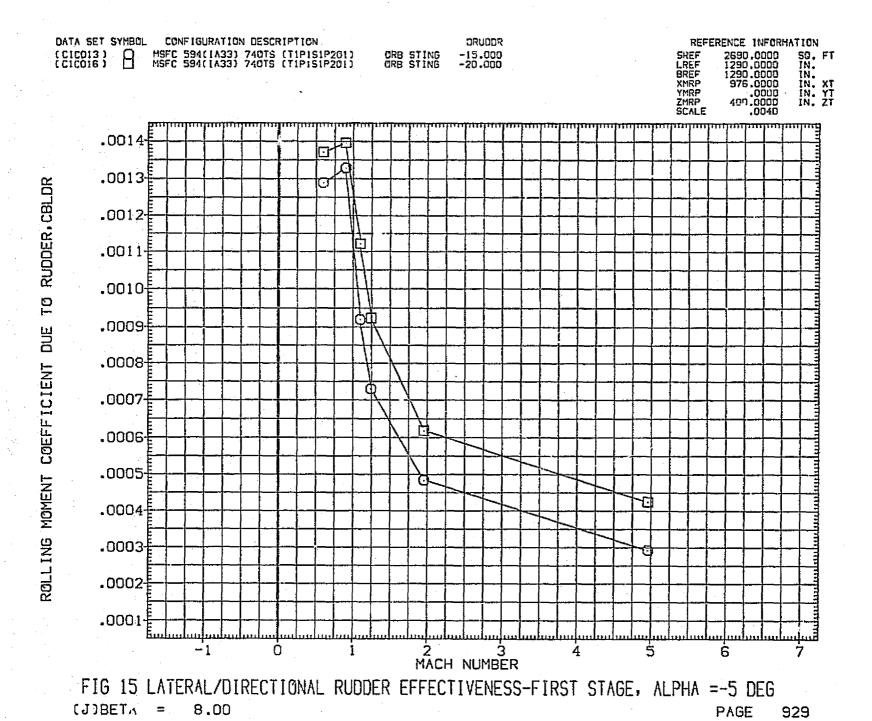


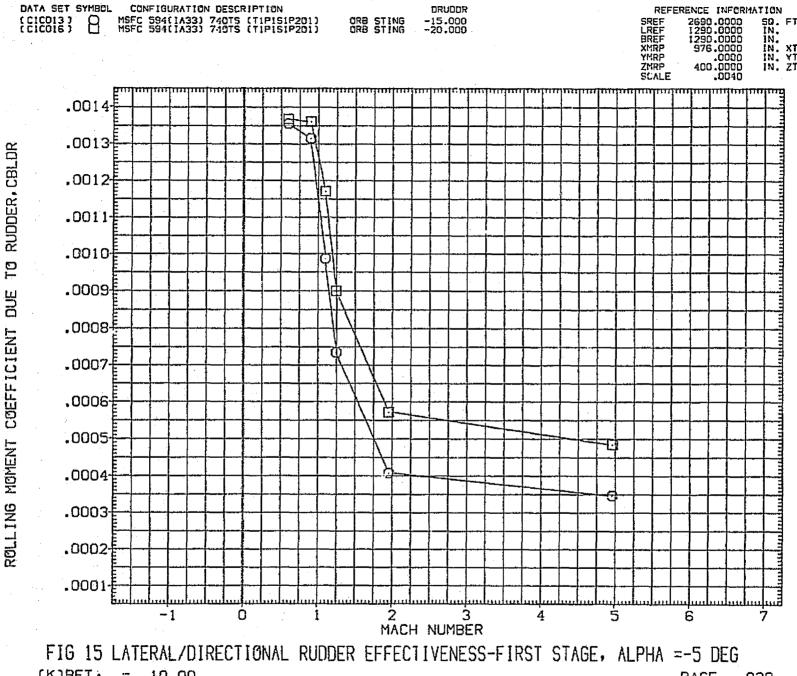






(I)BETA = PAGE 928





(K)BETA = 10.00 PAGE 930

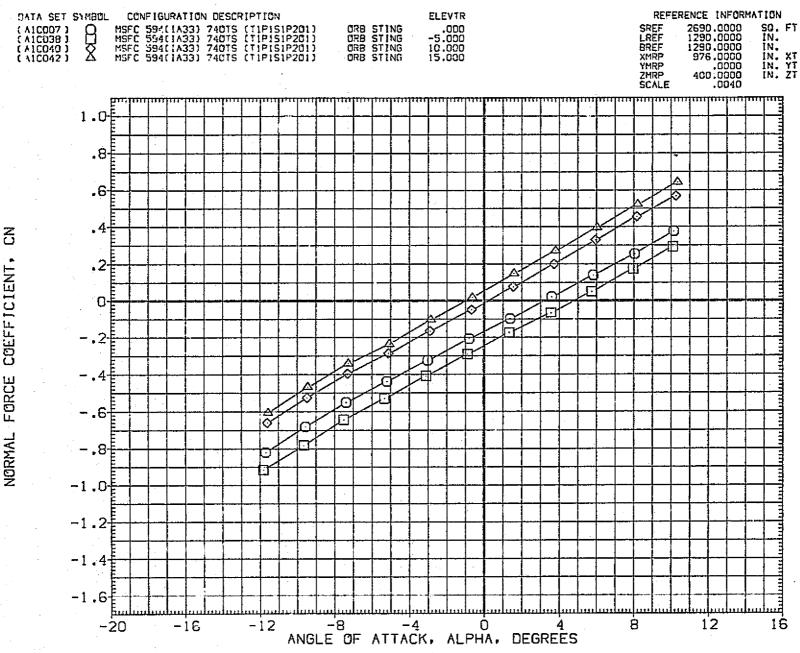


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(A)MACH = .60

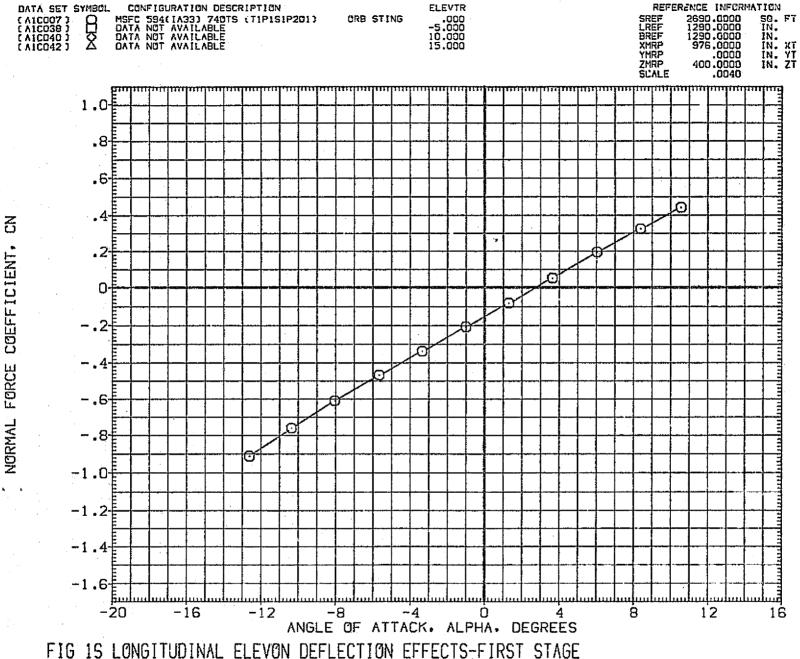
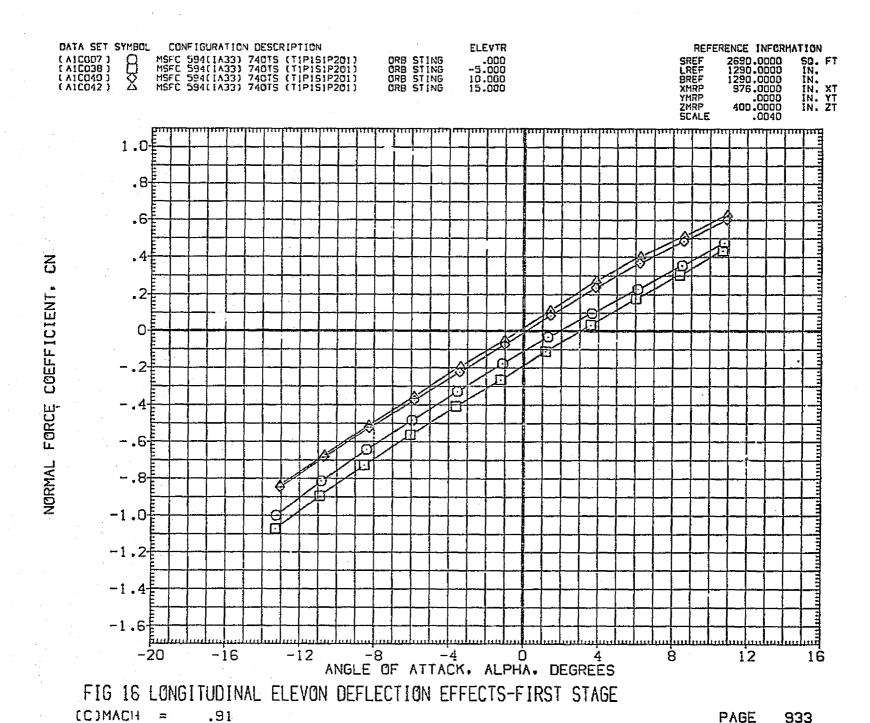


FIG 1S LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(B)MACH = .80



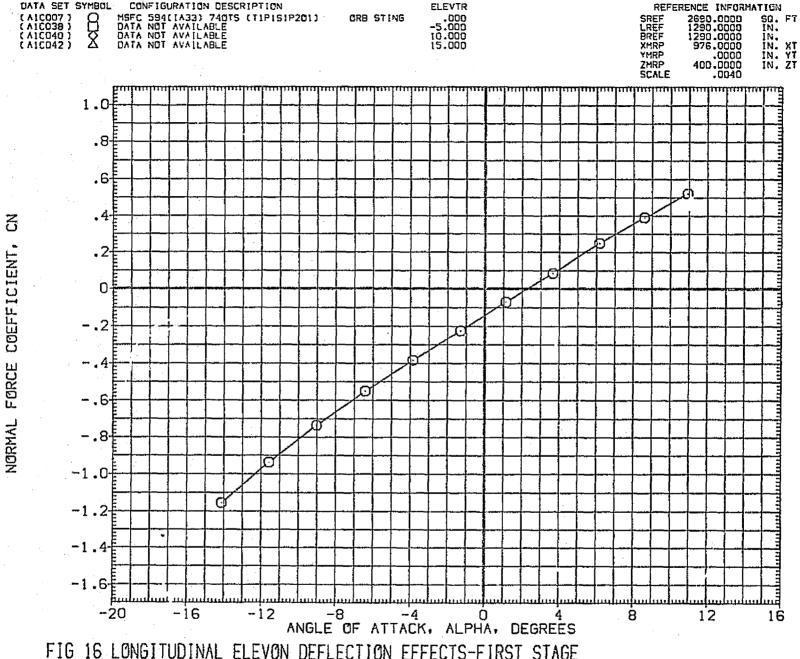


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE

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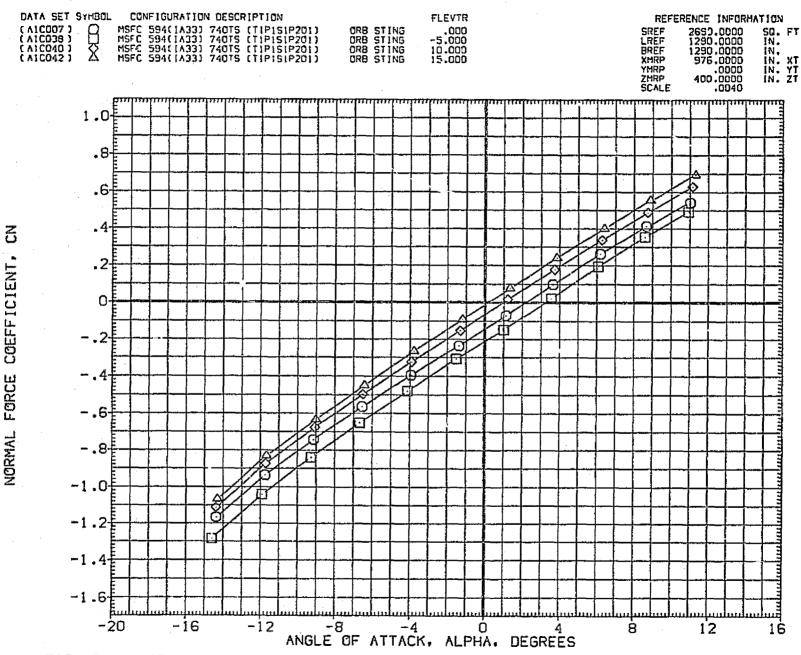
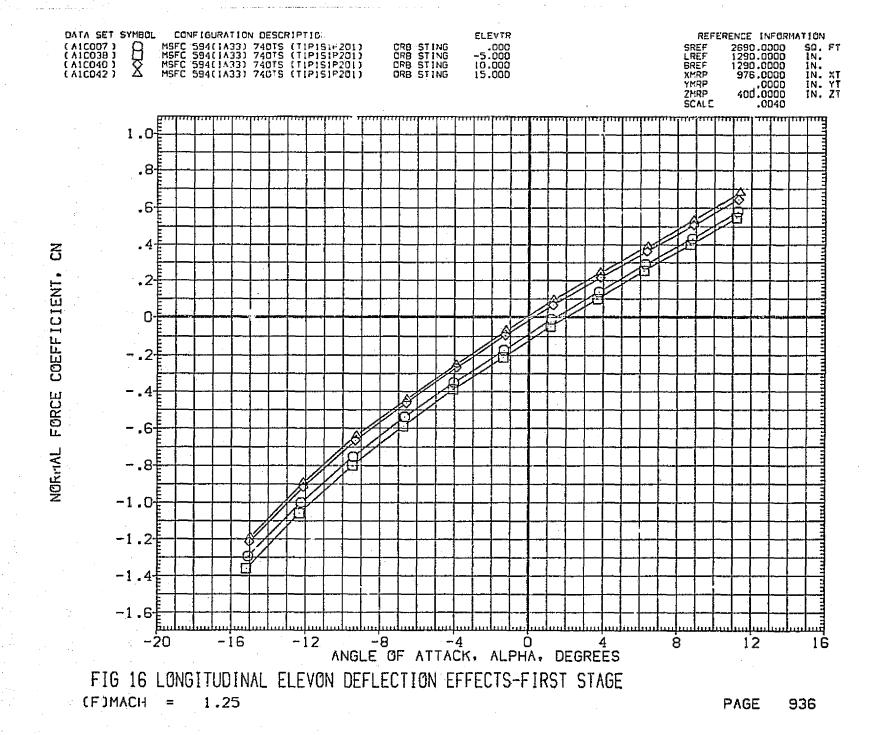
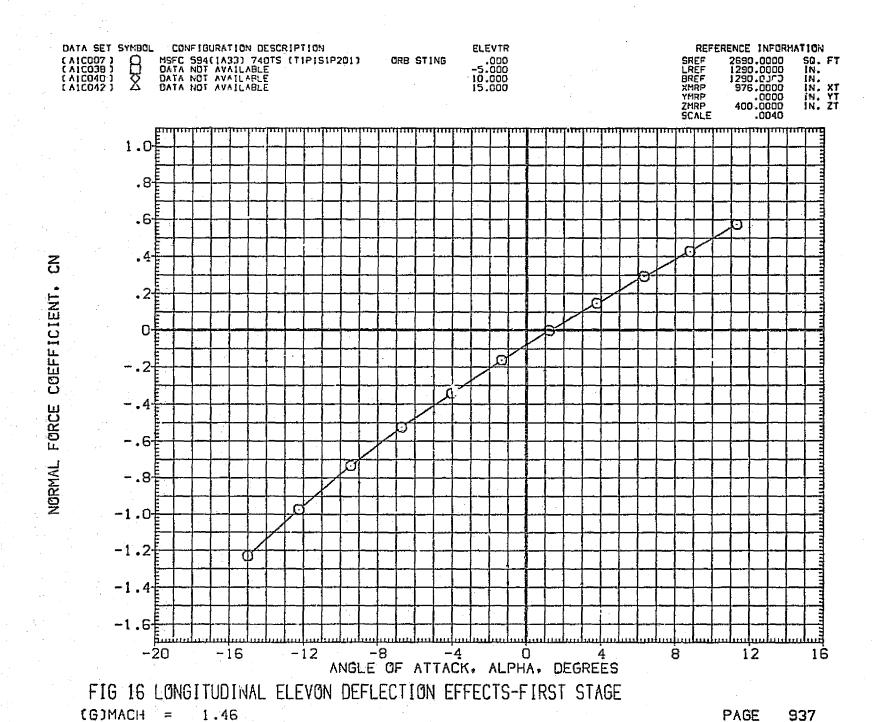


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(E)MACH = 1.10





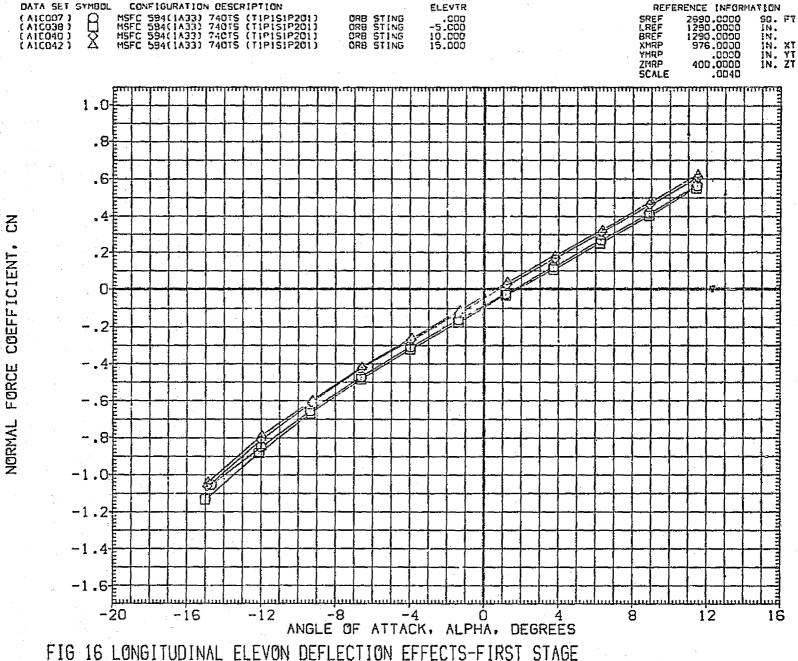


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(H)MACH = 1.97

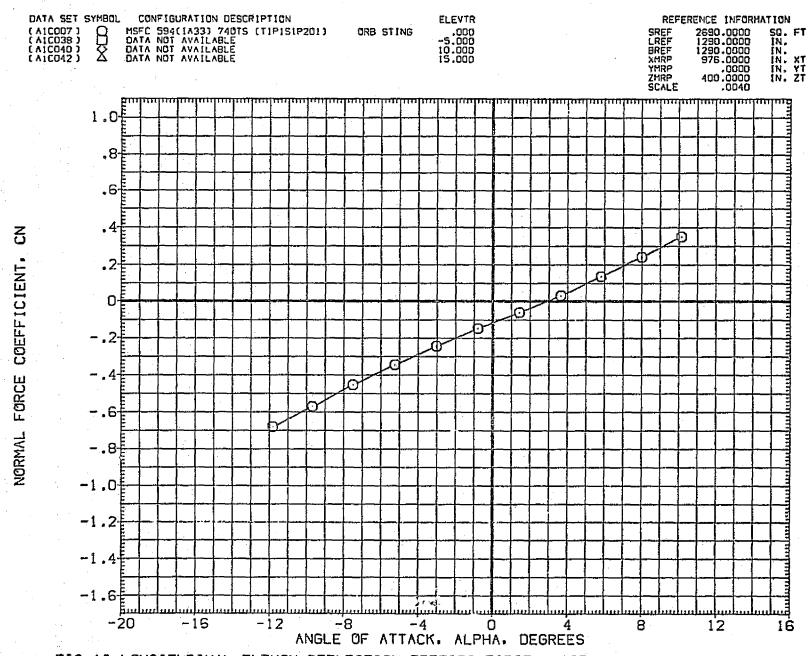
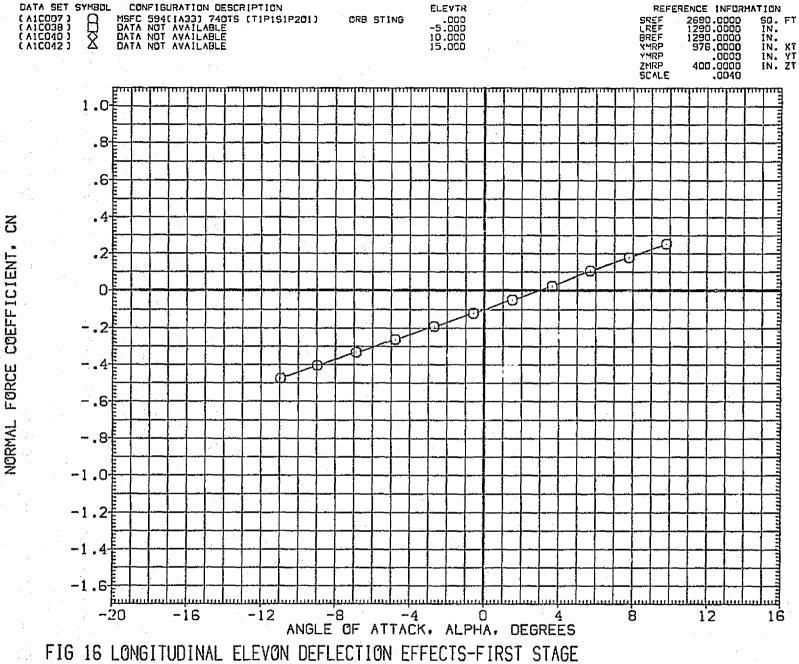


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE



(J)MACH =4.96

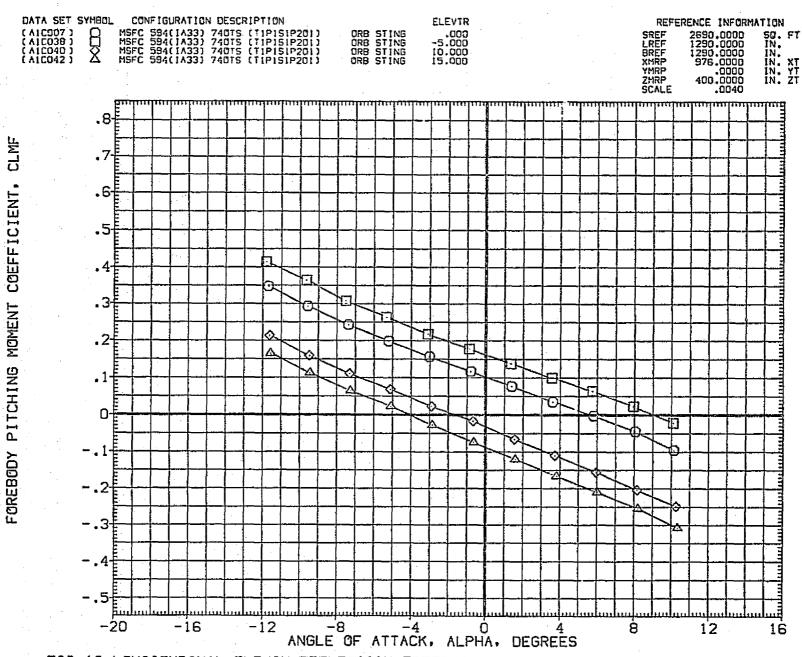
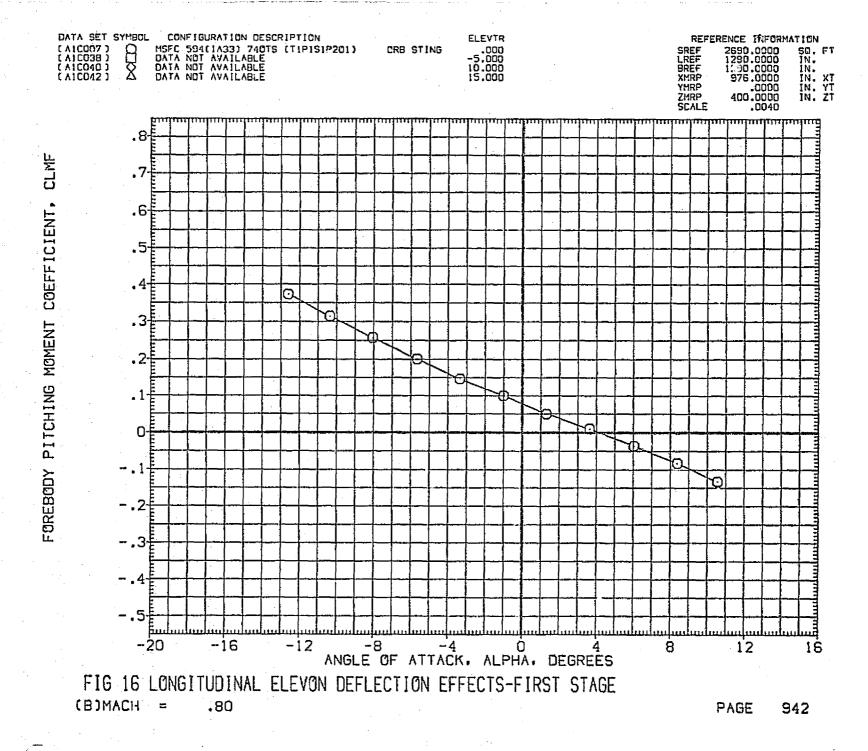


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(A)MACH = .60



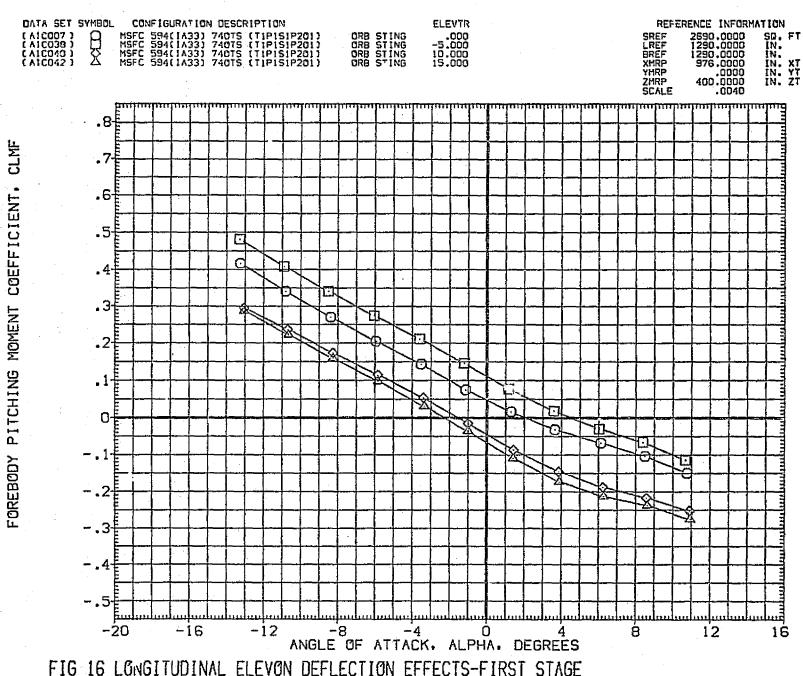


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE

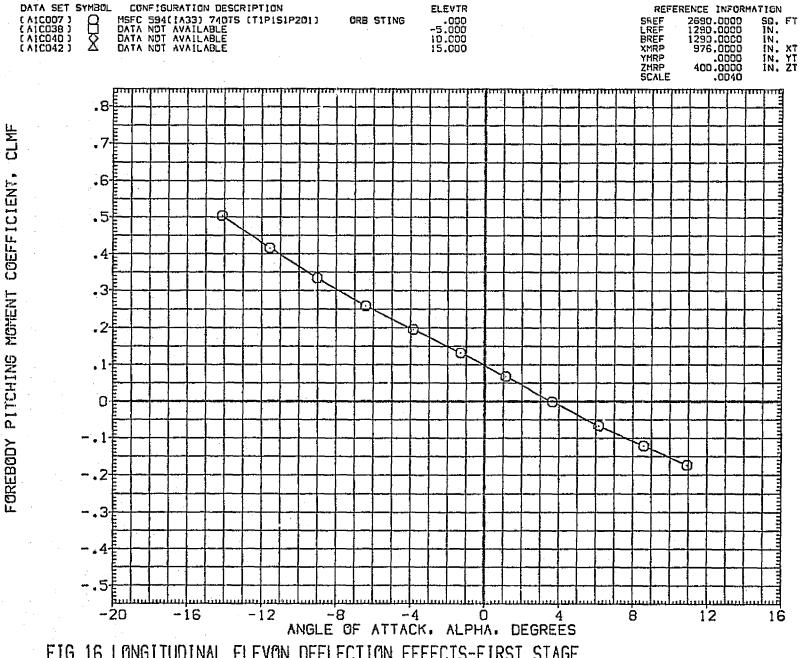


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
CD3MACH = 1.05

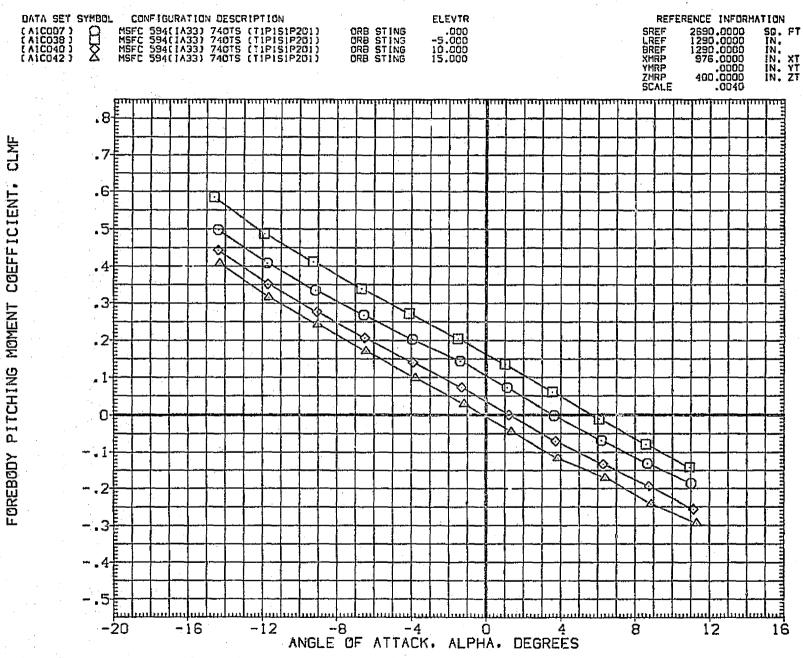
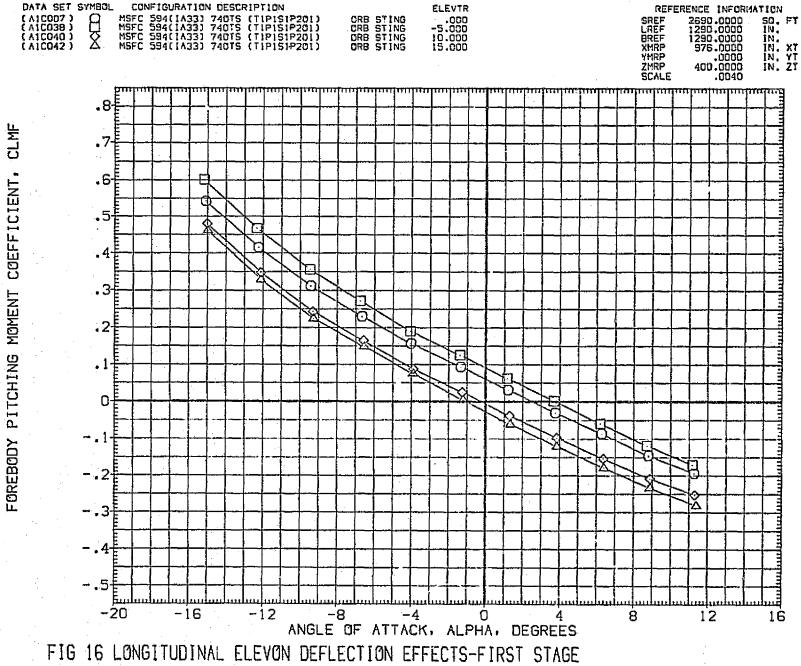


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(E)MACH = 1.10



(F)MACH =

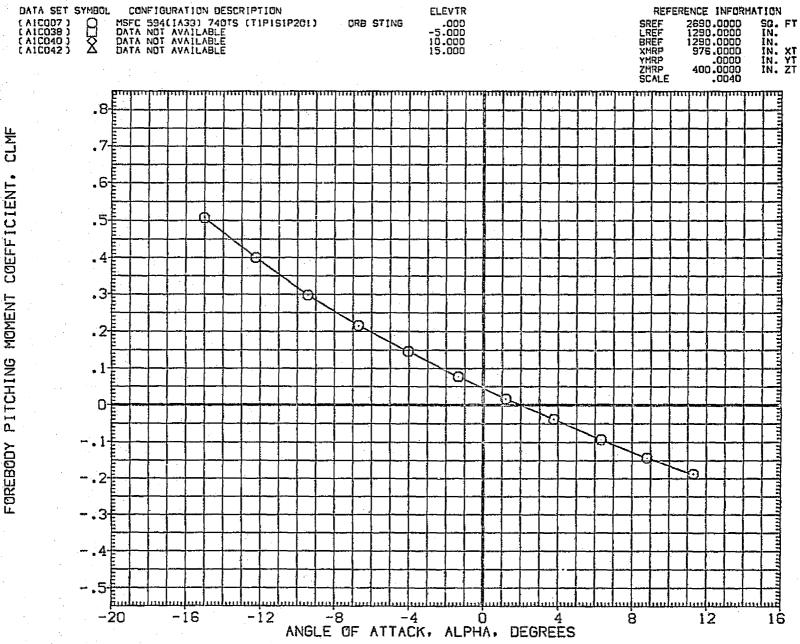


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(G)MACH = 1.46

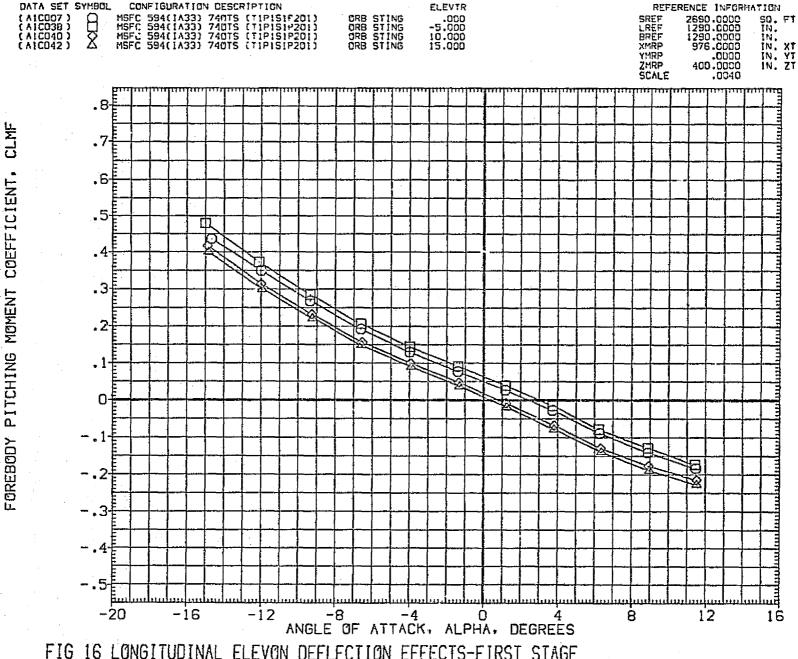


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE

(H)MACH = 1.97

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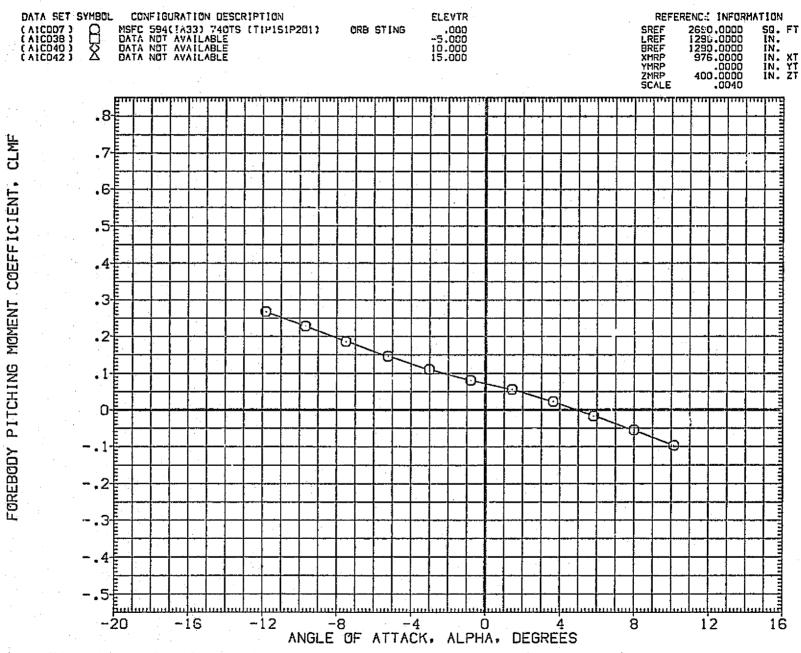
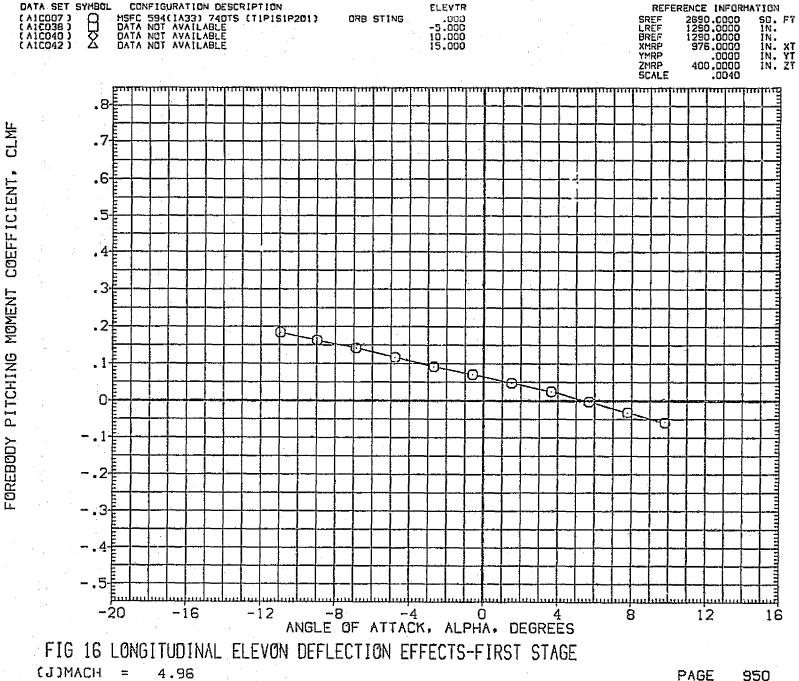
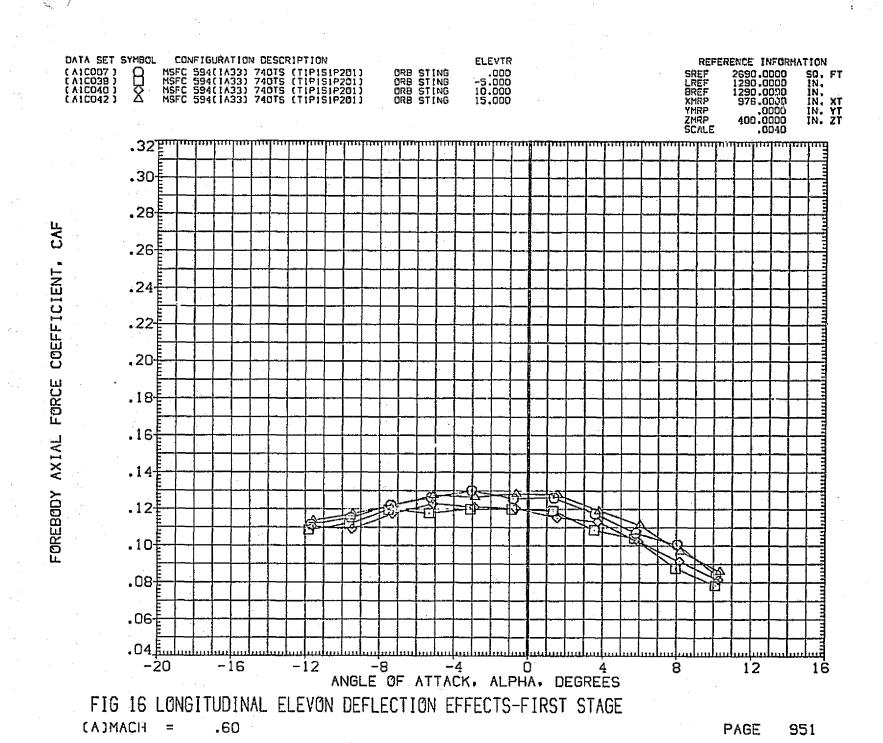
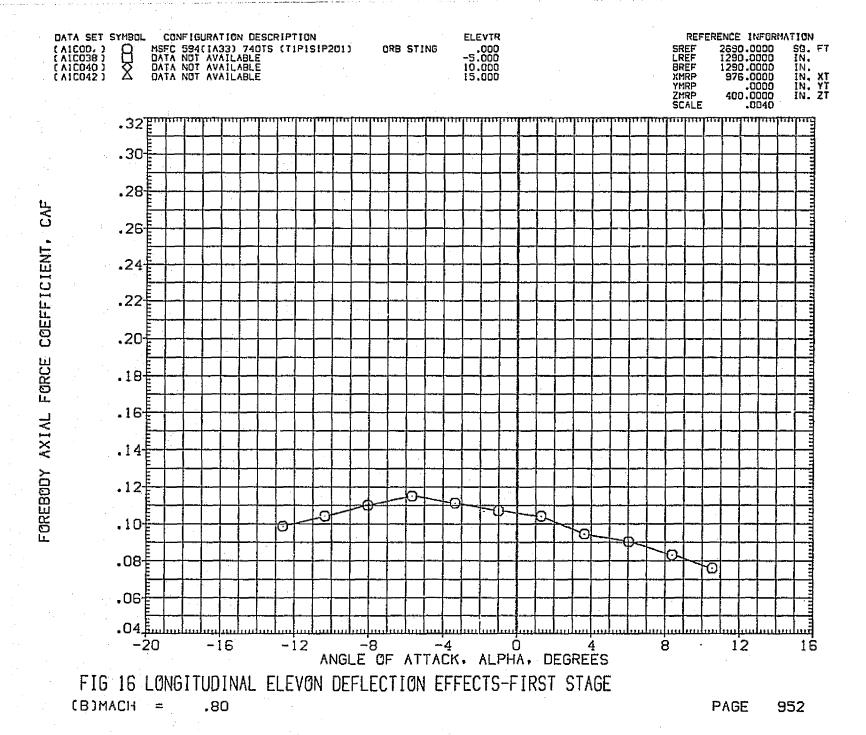


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE



4.96





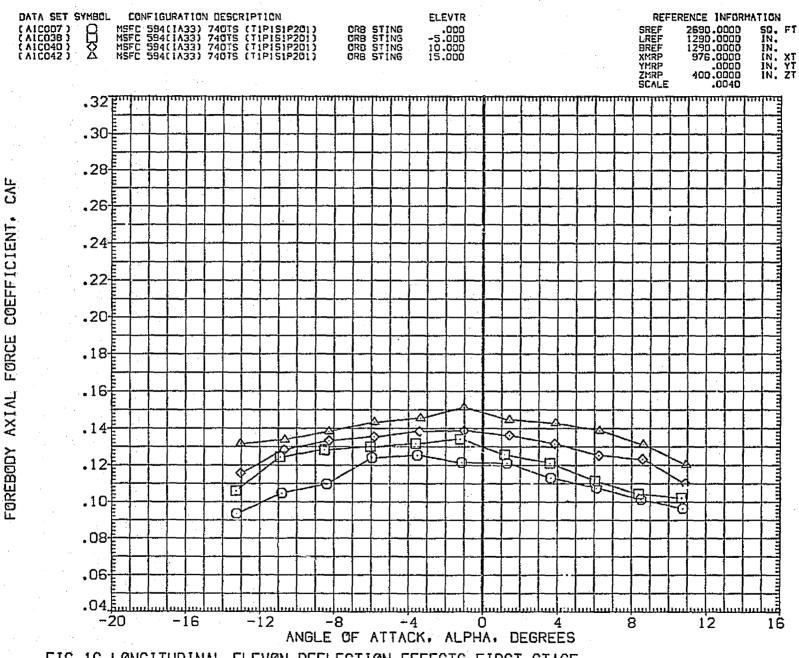


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE

(C)MACH = .91

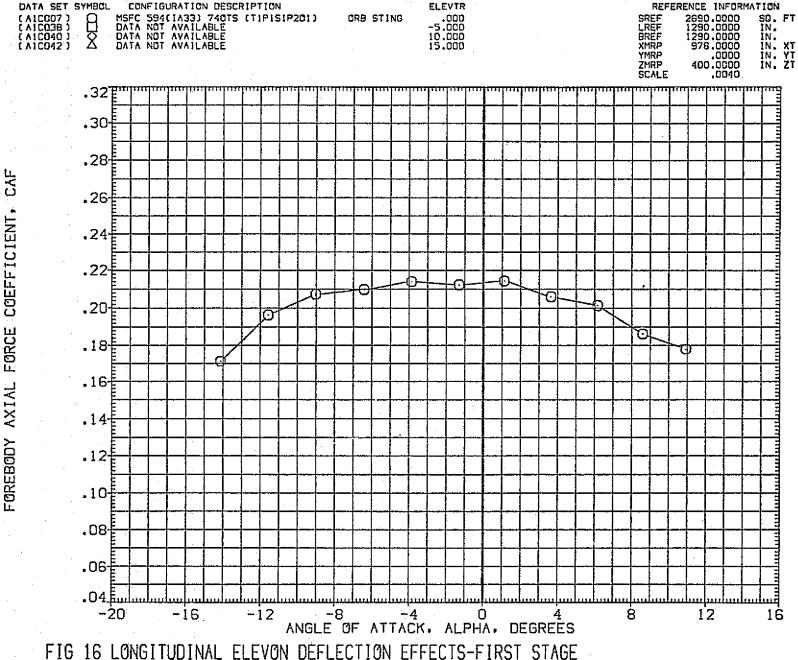


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE

(D)MACH = 1.05

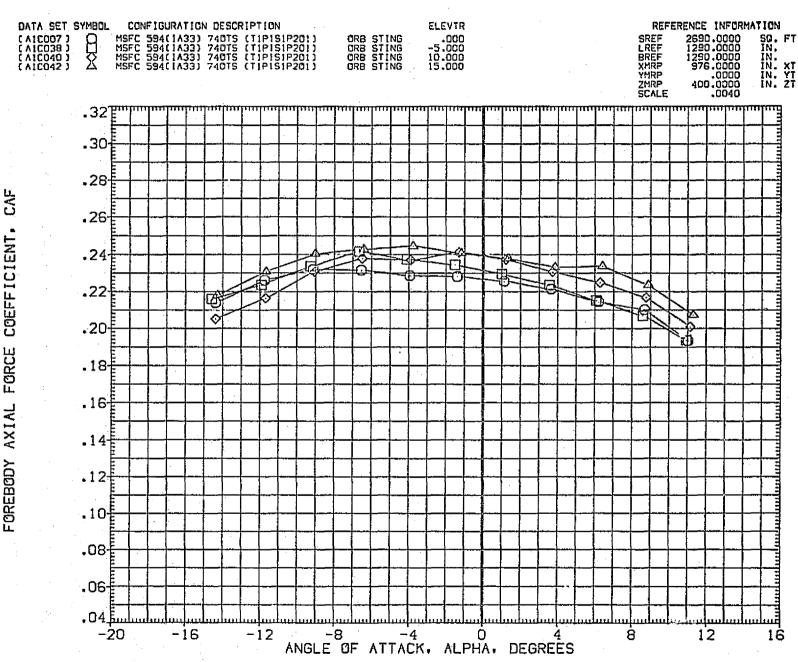
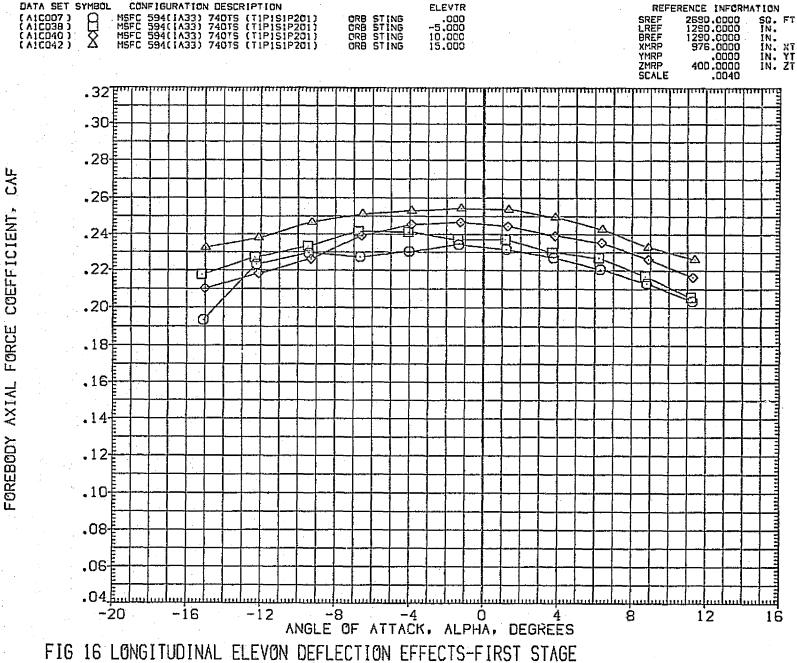


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(E)MACH = 1.10



(F)MACH = 1.25

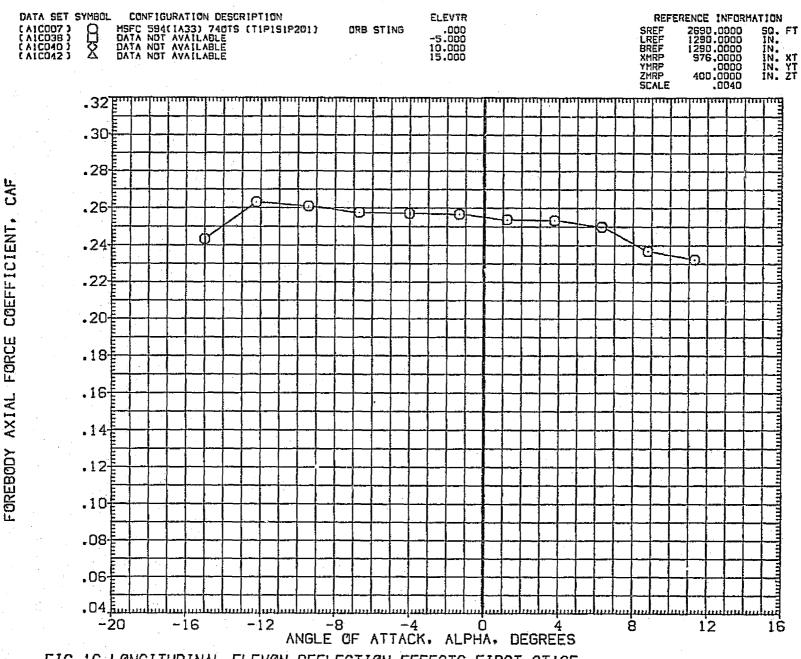


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(G)MACH = 1.46

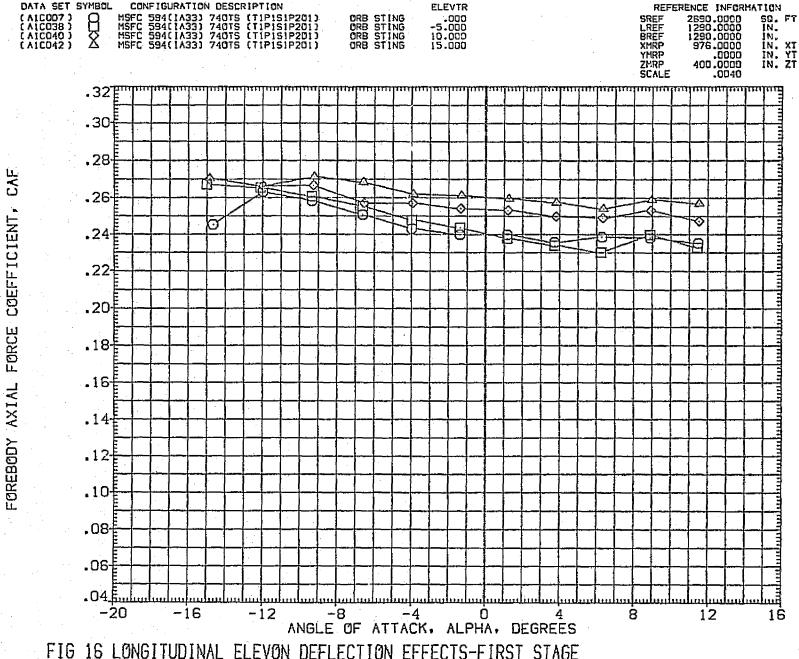


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(H)MACH = 1.97

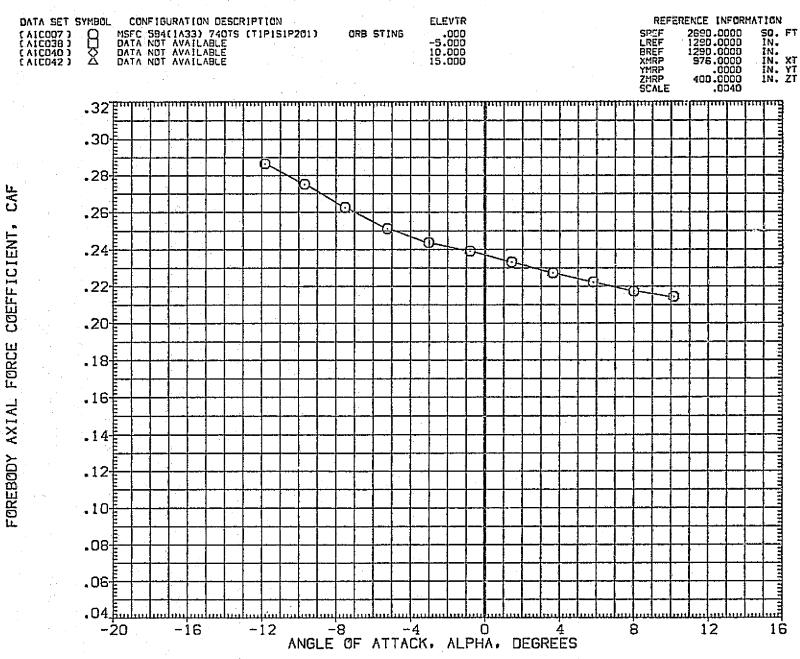


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(1)MACH = 2.99

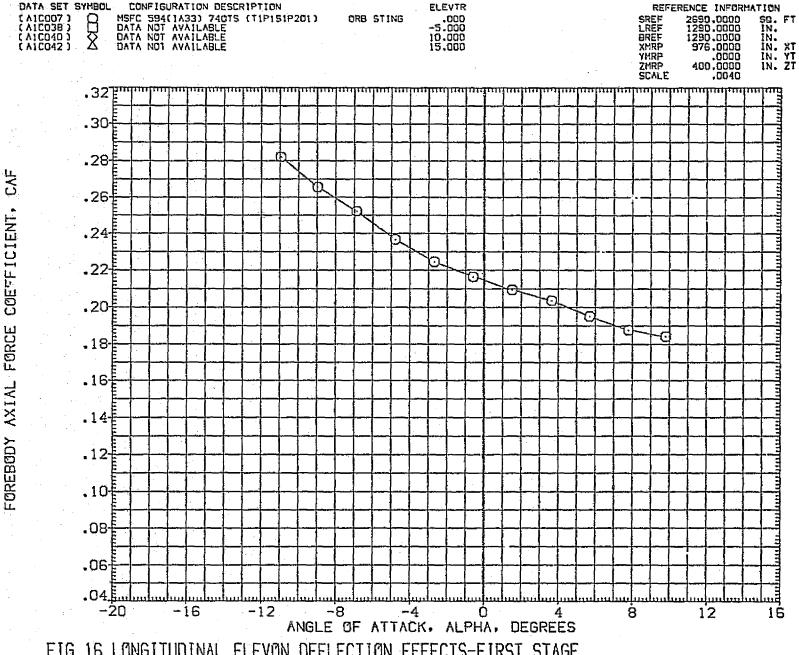


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE

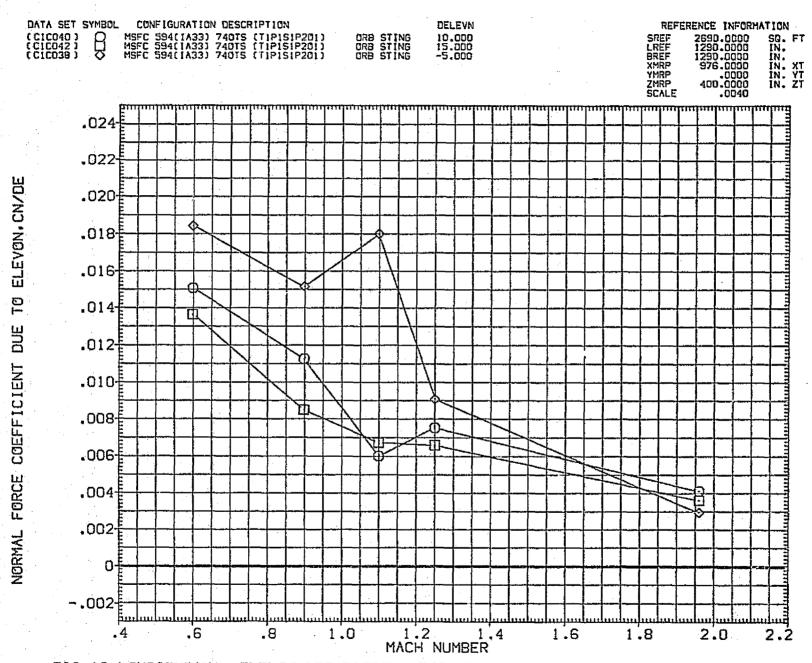
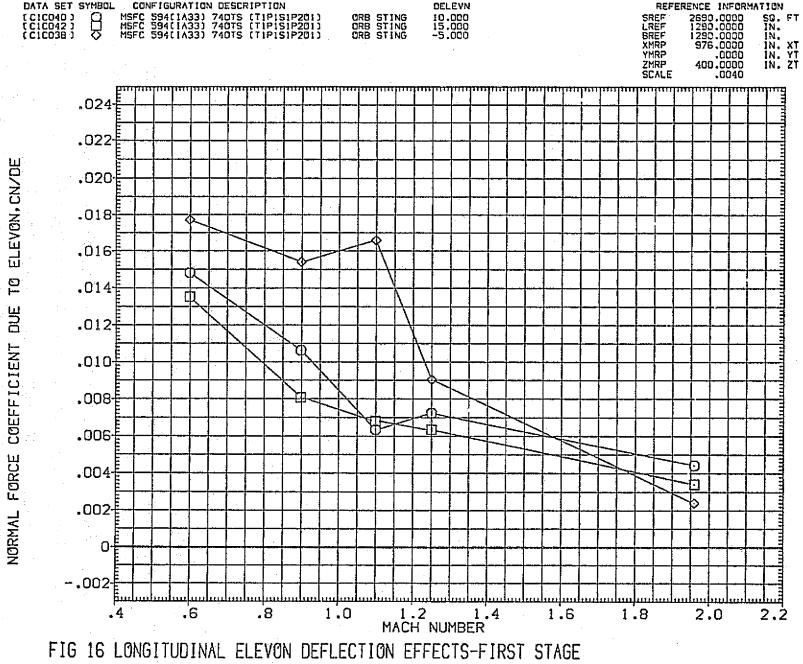


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE



(B)ALPHA = -8.00

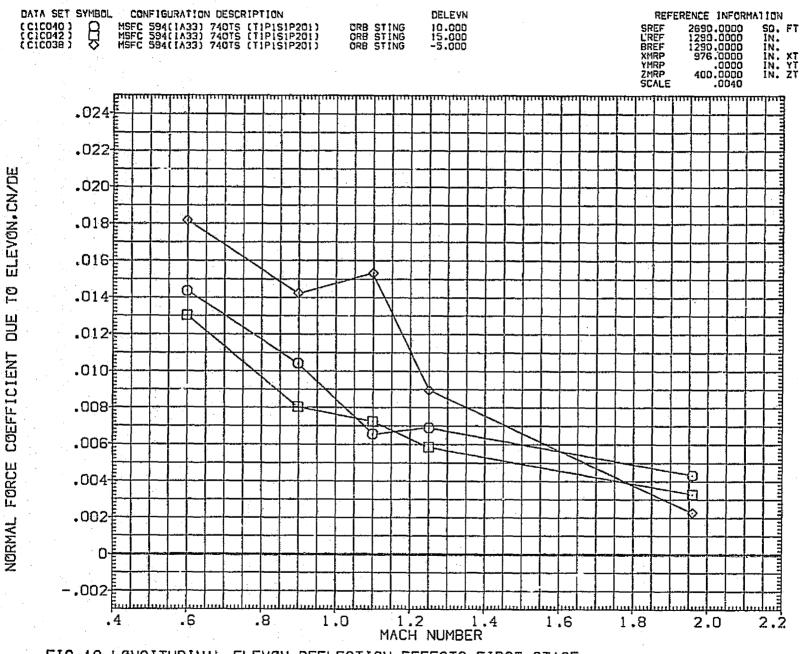


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE (C)ALPHA = -6.00

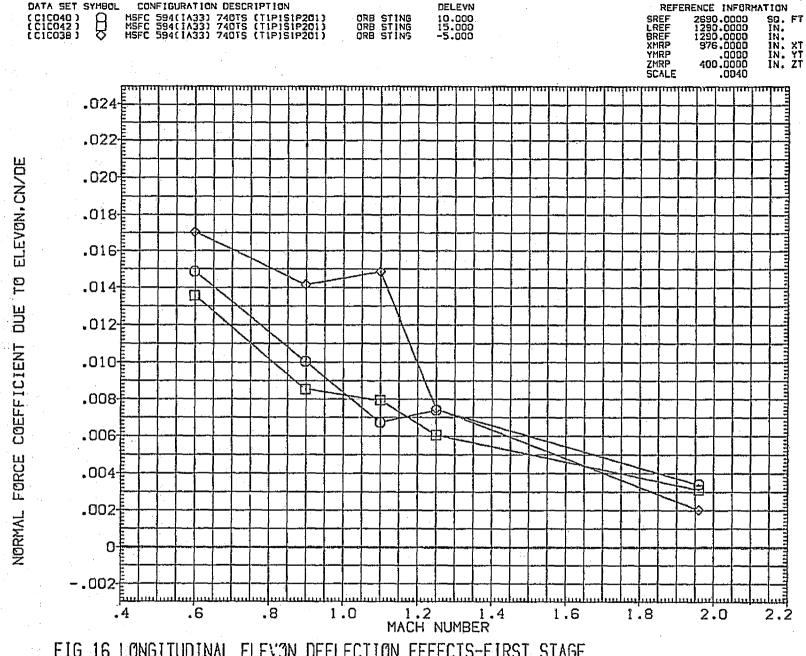


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE (D)ALPHA = -4.00

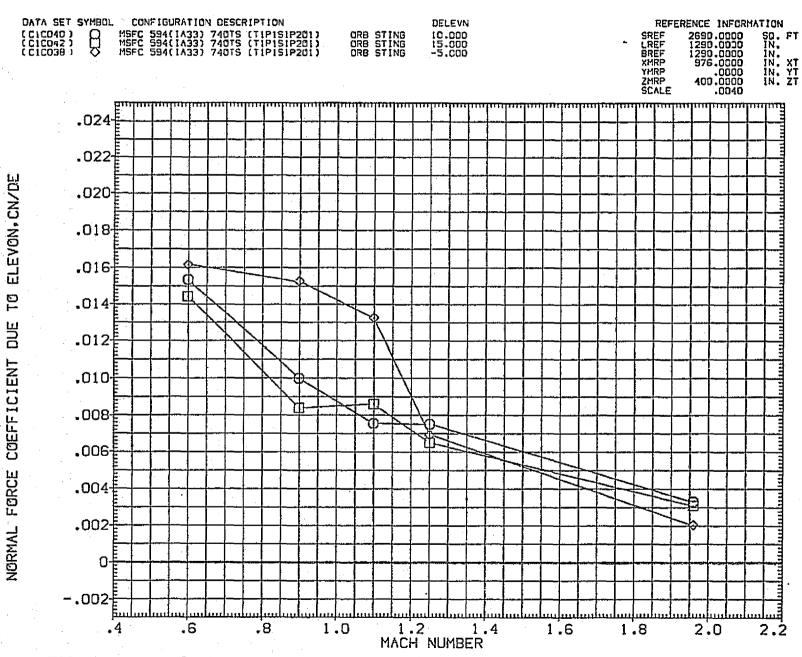
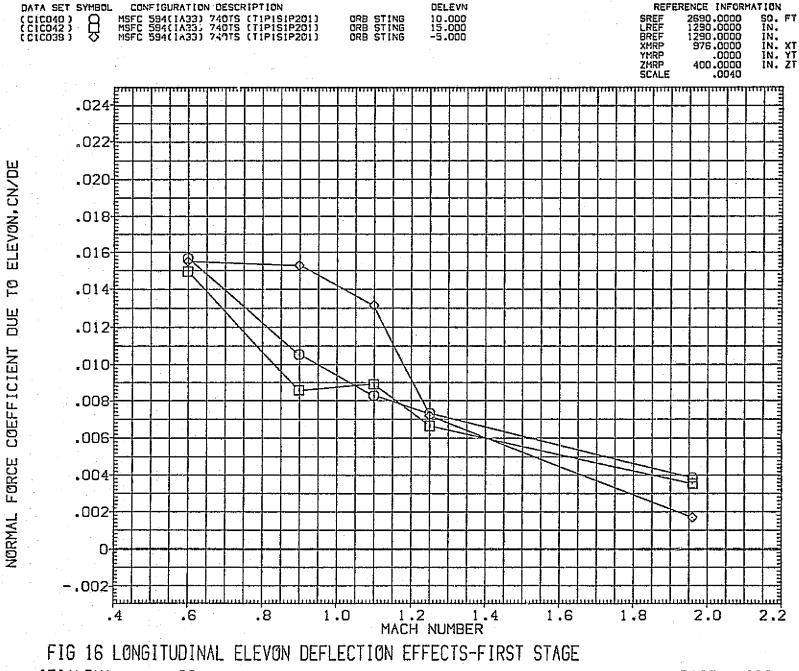


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(E)ALPHA = -2.00



(F)ALPHA =

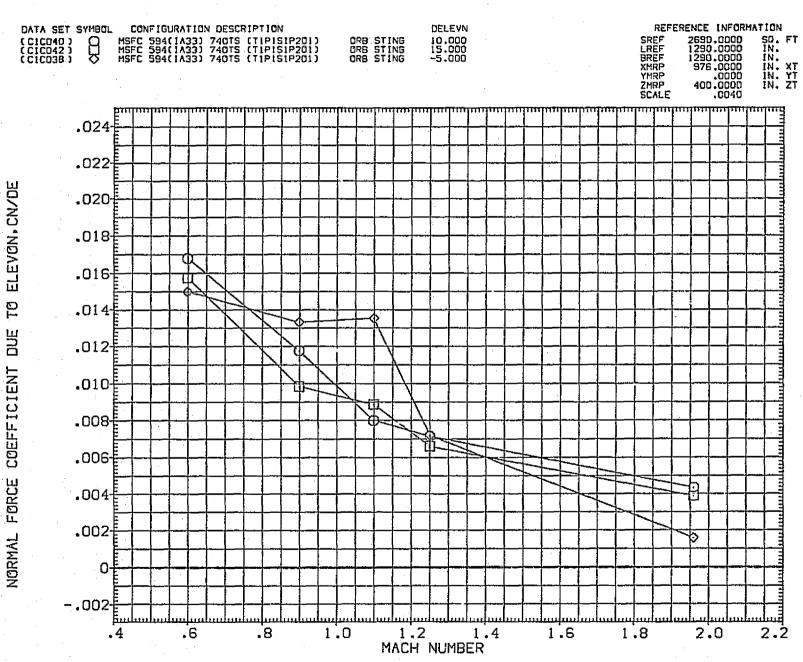
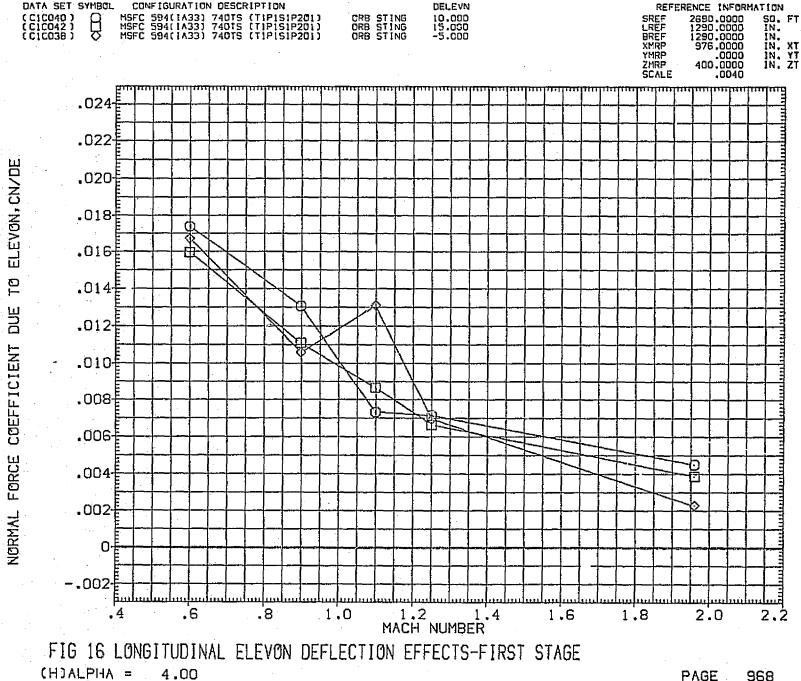


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE

(G) ALPHA = 2.00



(H)ALPHA = 4.00

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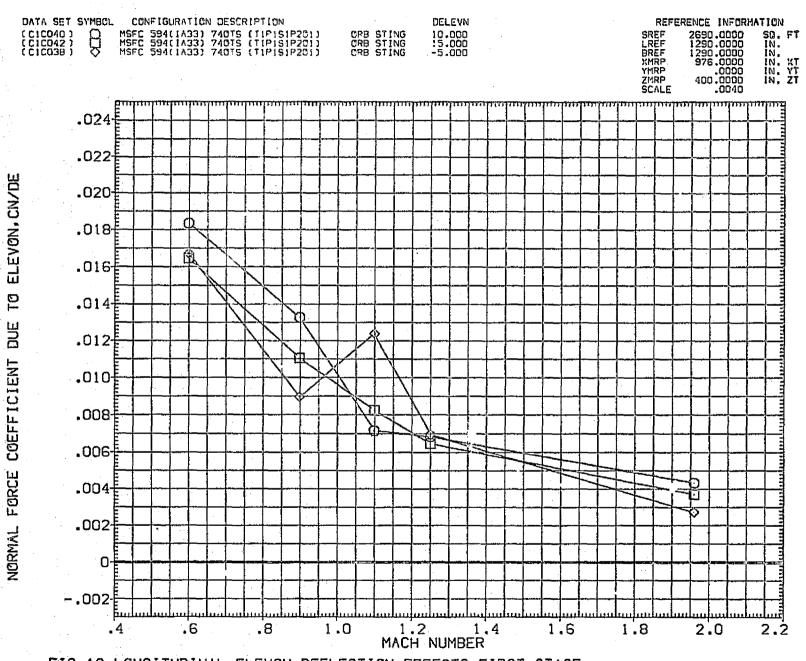
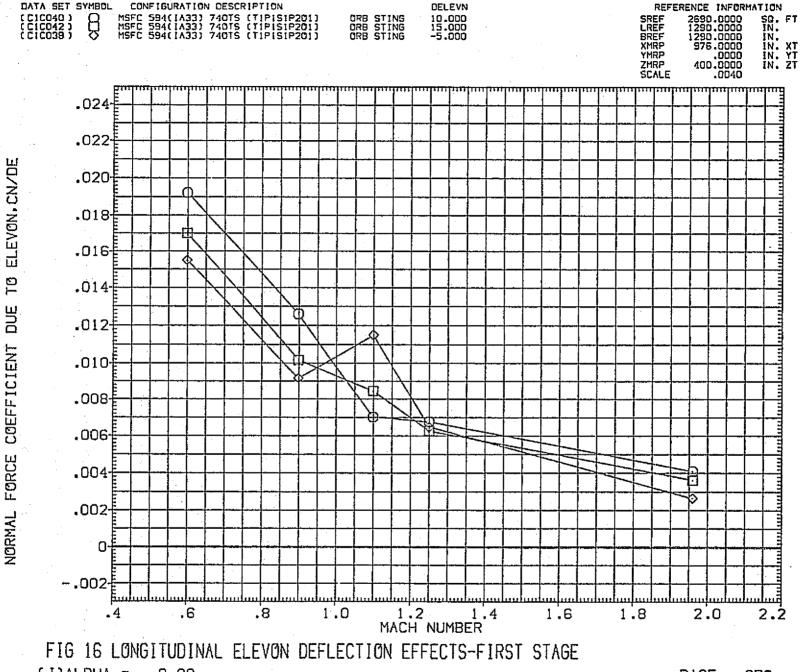


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(I)ALPHA = 6.00



(J)ALPHA =8.00

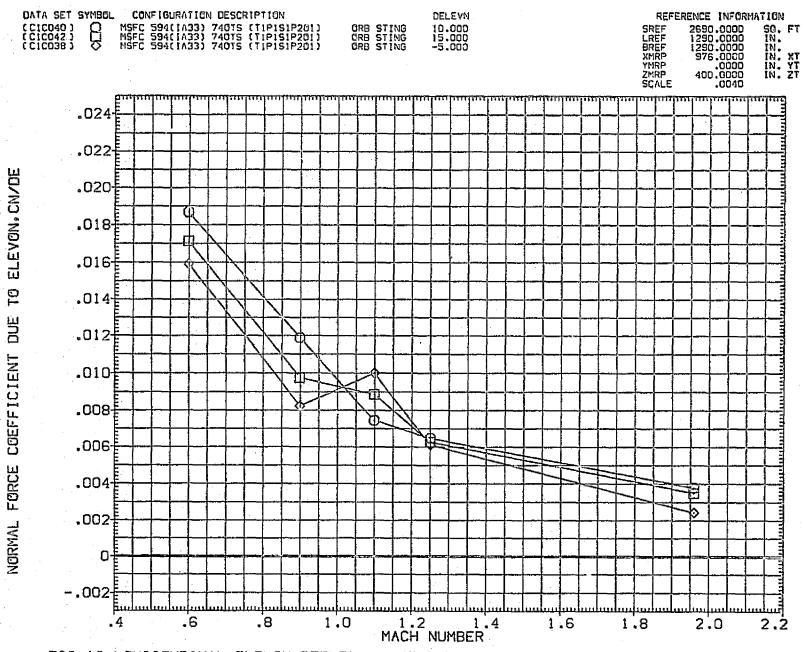


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(K)ALPHA = 10.00



FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE (A)ALPHA = -10.00

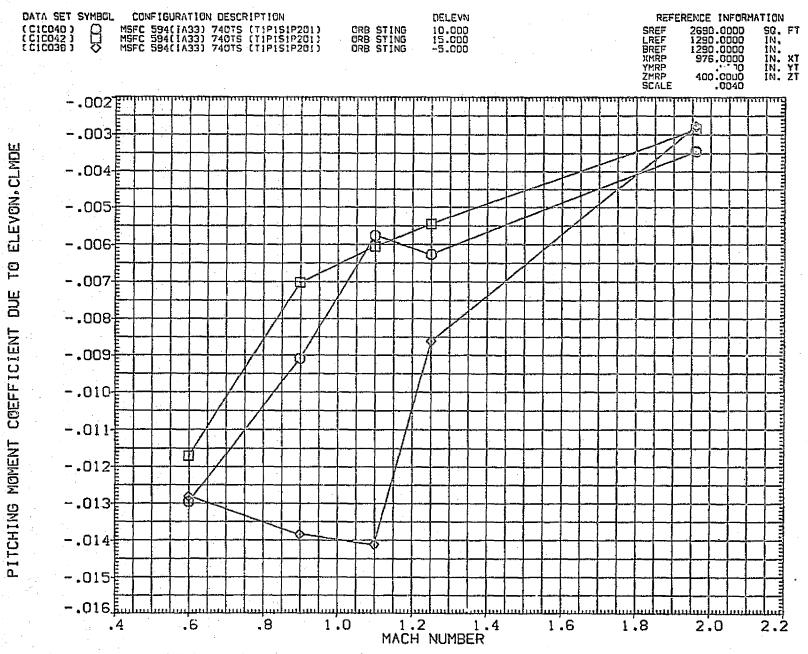


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(B)ALPHA = -8.00

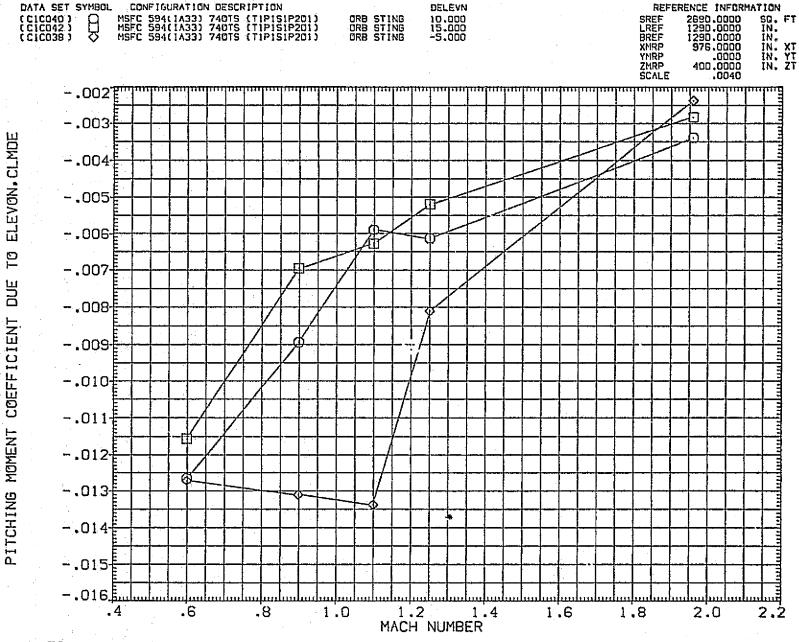


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(C)ALPHA = -6.00

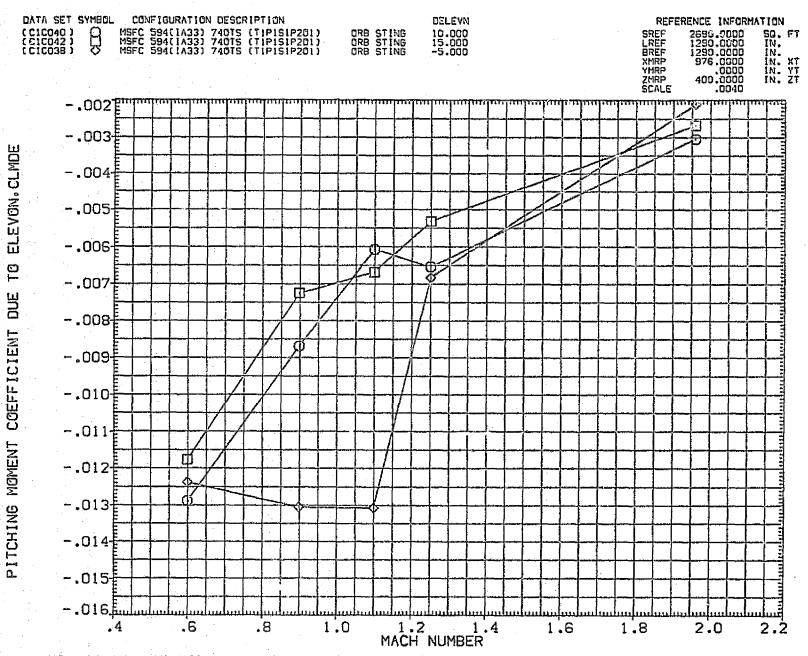
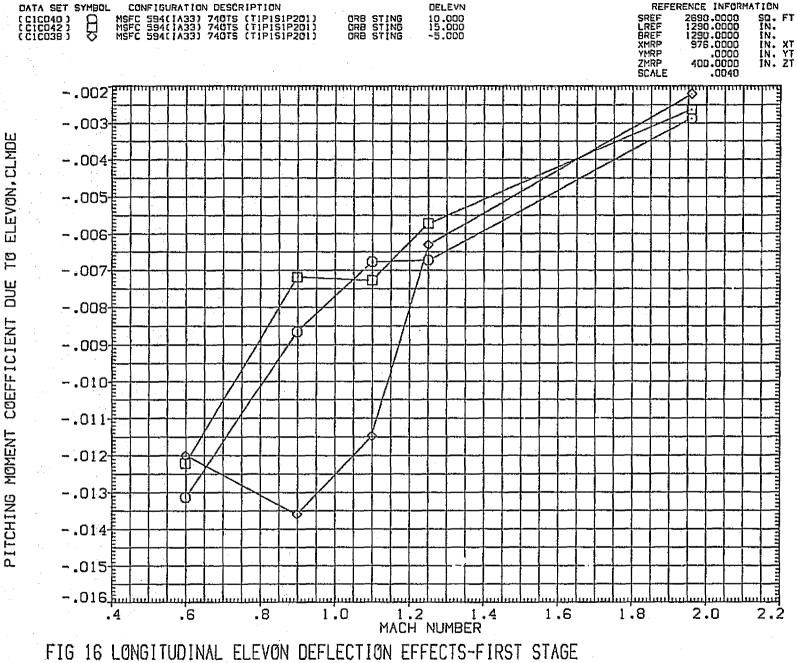


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(D)ALPHA = -4.00



(E)ALPHA = -2.00

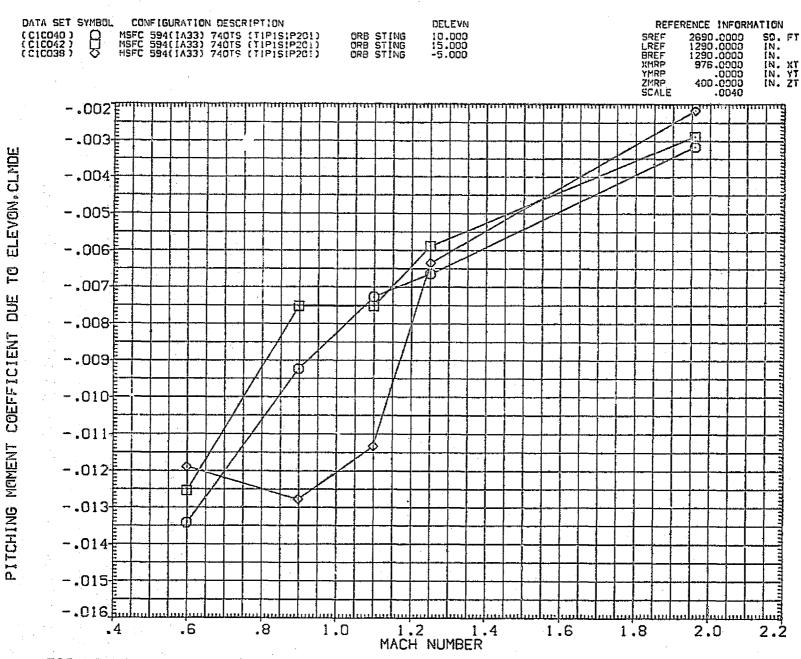


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(F)ALPHA = .00

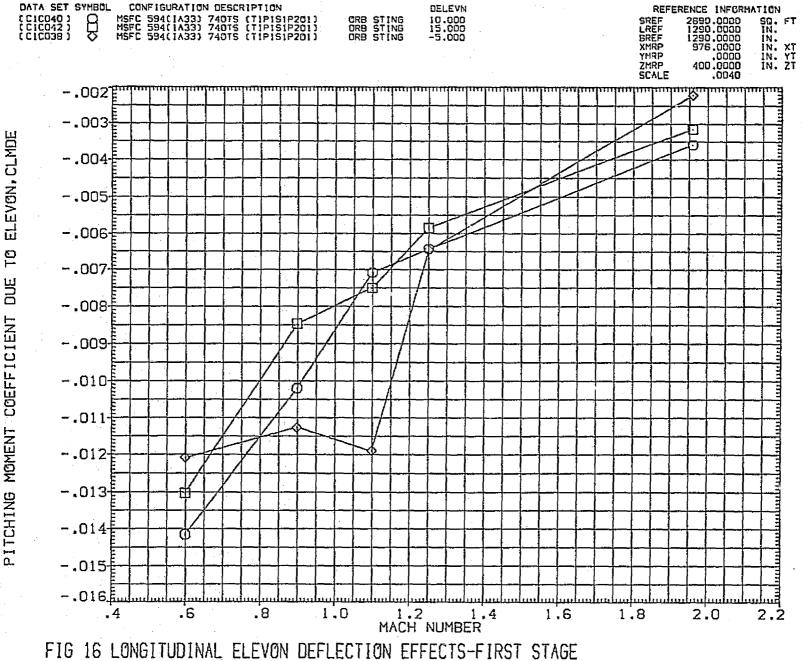


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(G)ALPHA = 2.00

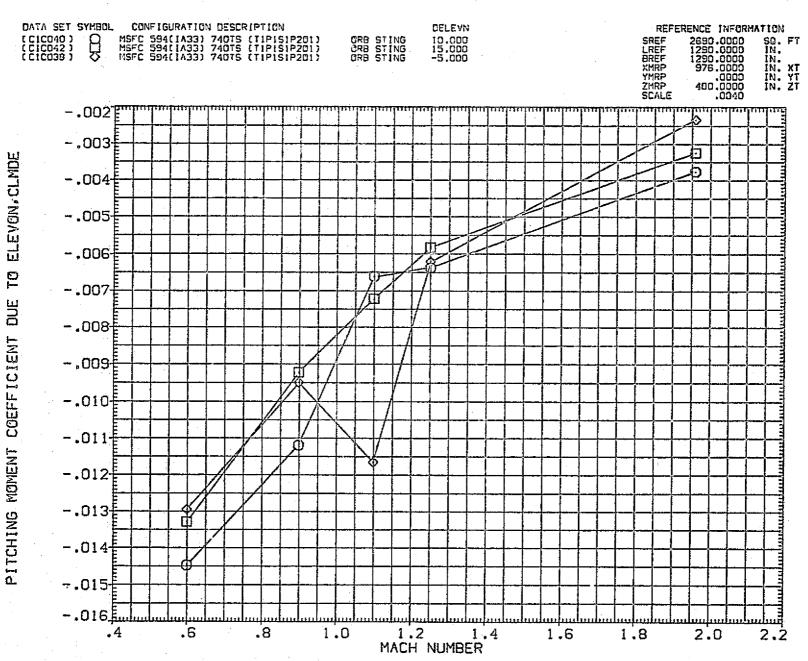


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(H)ALPHA = 4.00

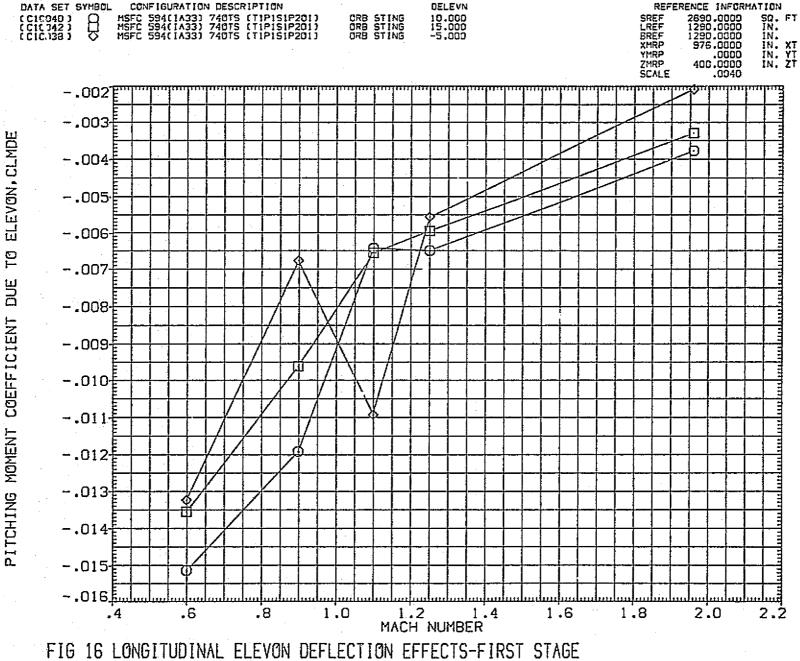


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE

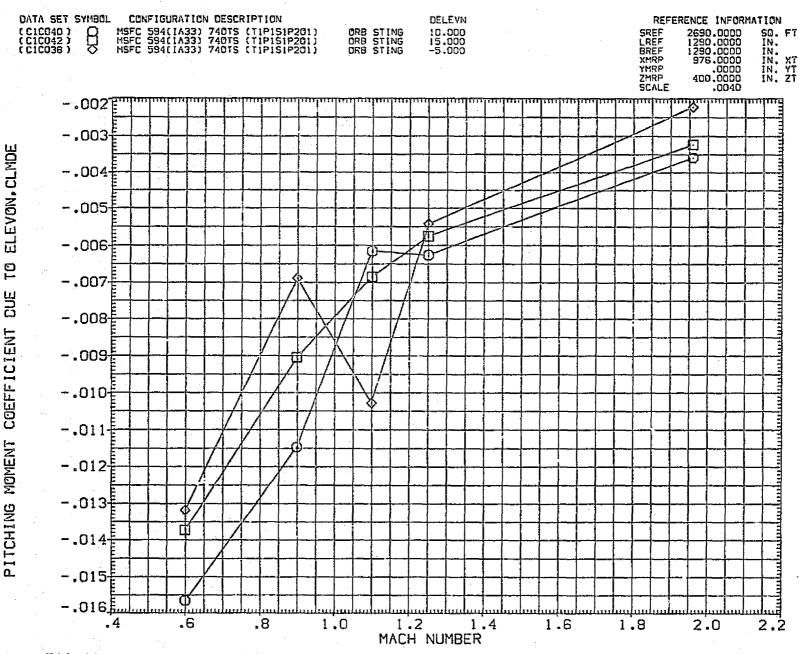


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(J)ALPHA = 8.00

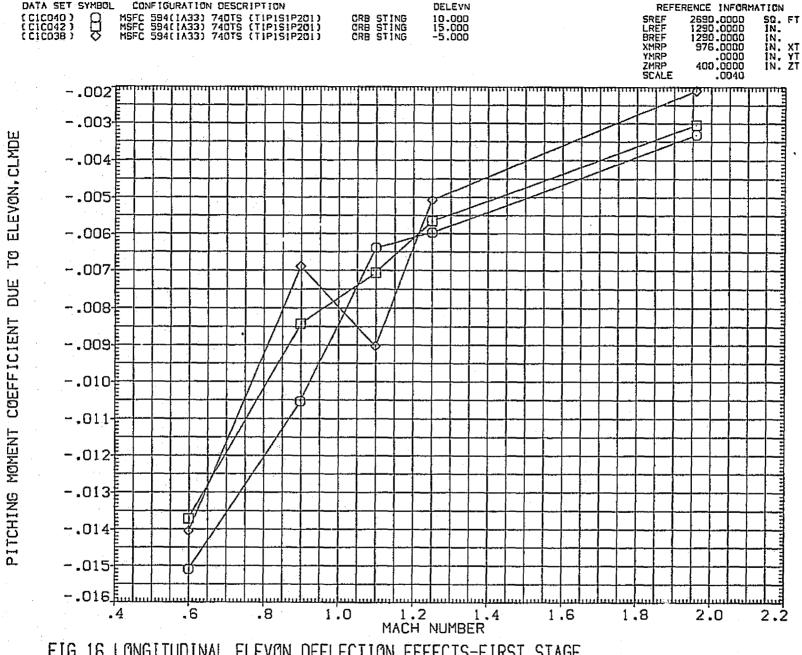


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE (K)ALPHA = 10.00

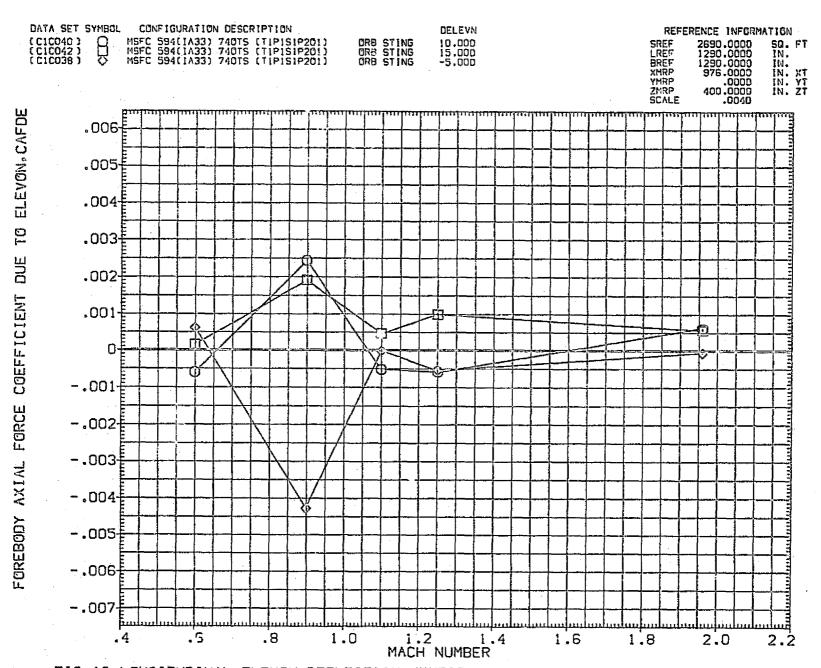


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(A)ALPHA = -10.00

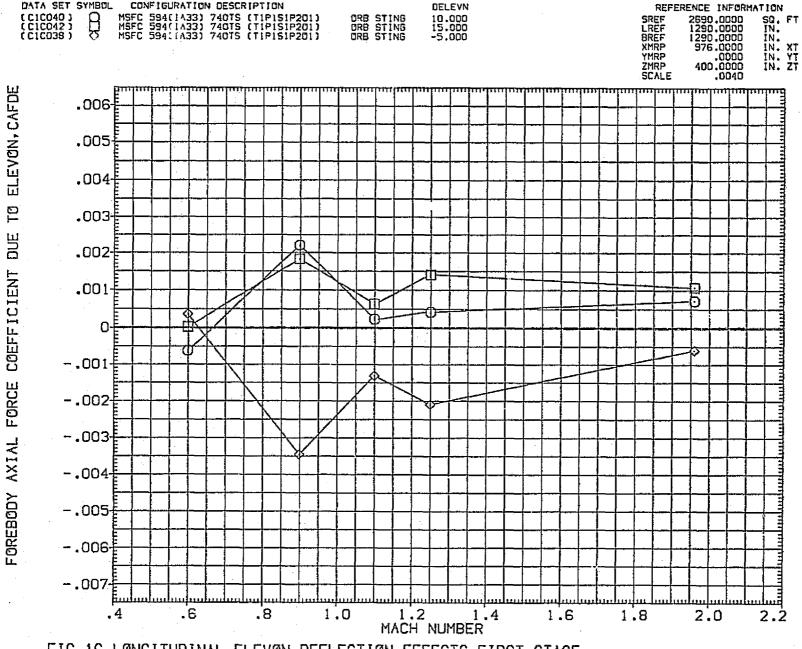


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE

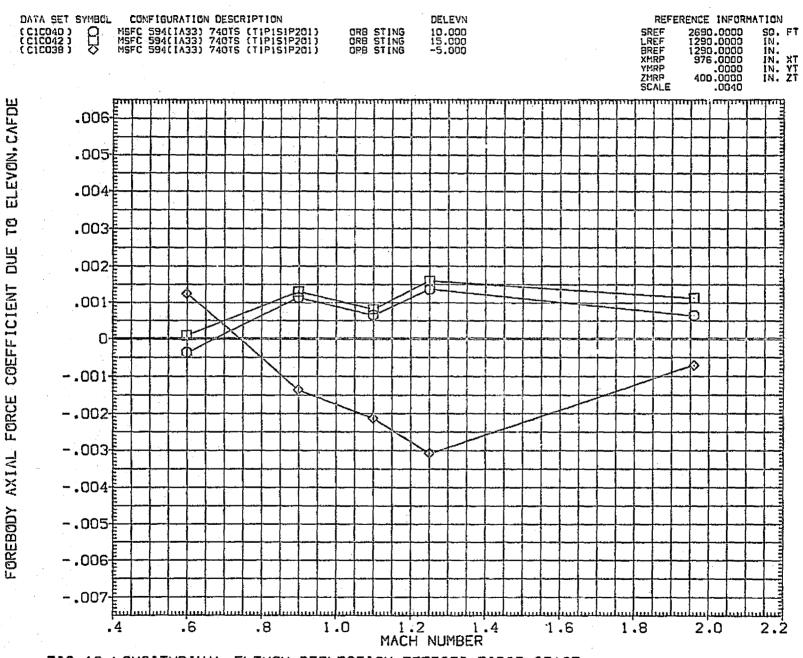


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE (C)ALPHA = -6.00

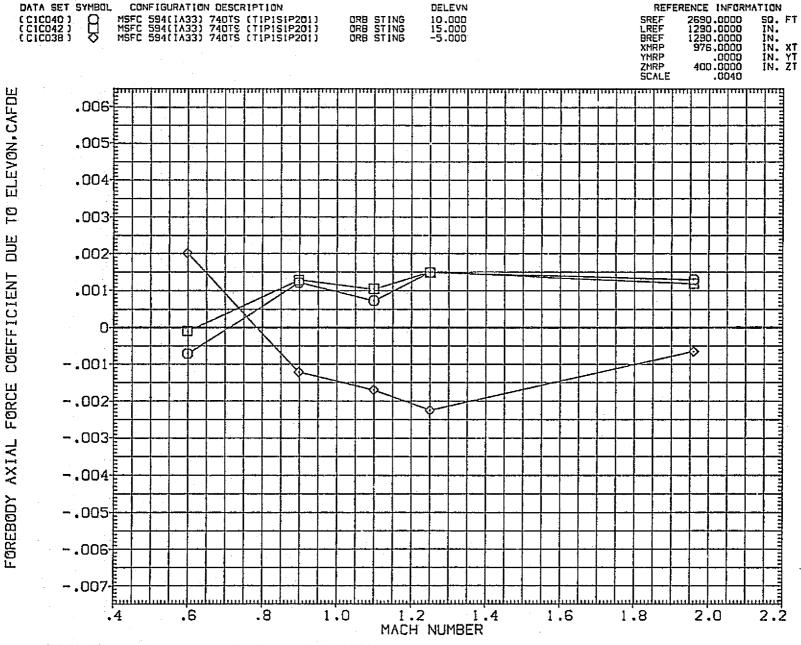


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE

(D)ALPHA = -4.00

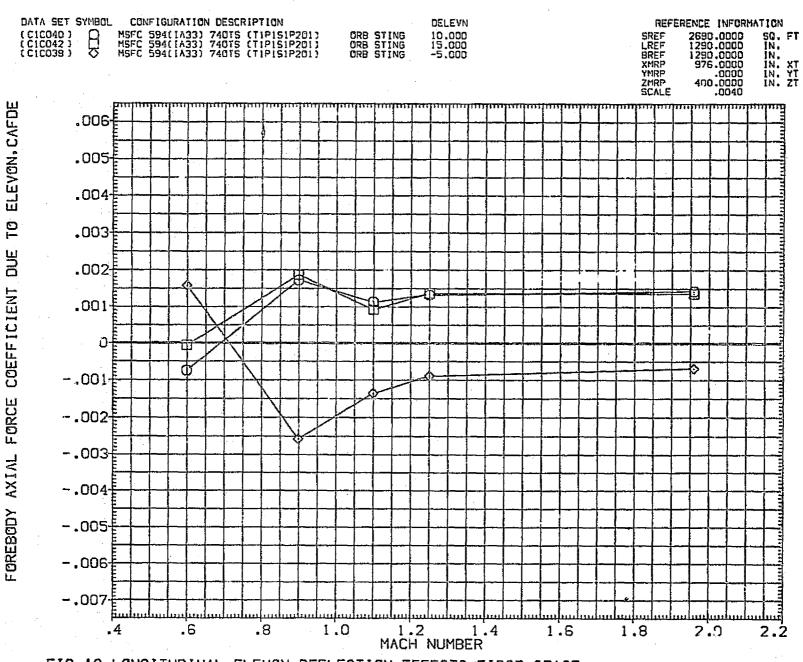


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(E)ALPHA = -2.00

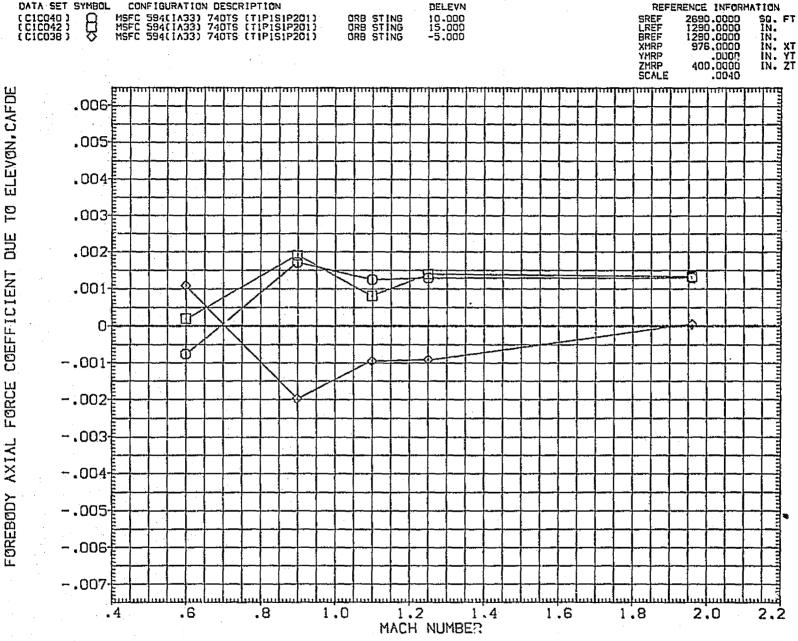


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(F)ALPHA = .00

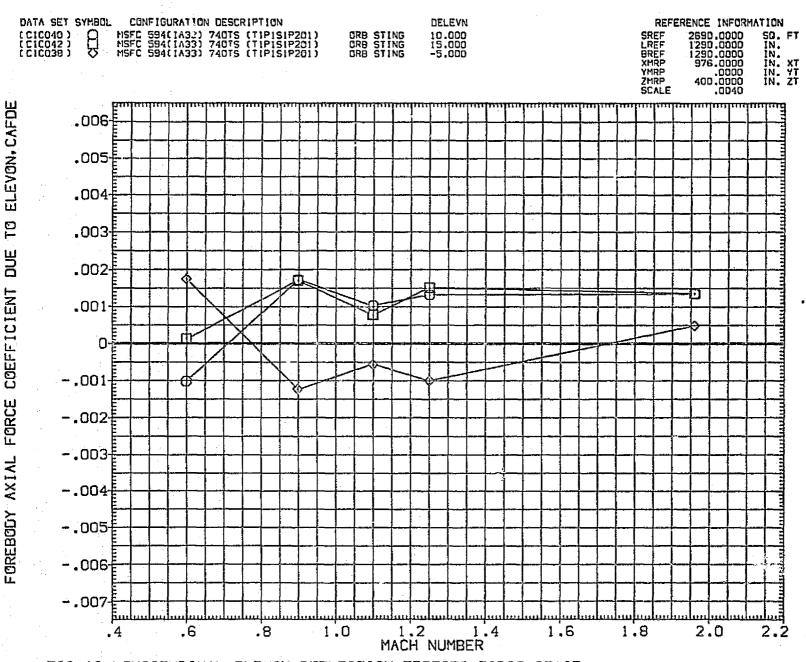


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(G)ALPHA = 2.00

**;--**: **,** 

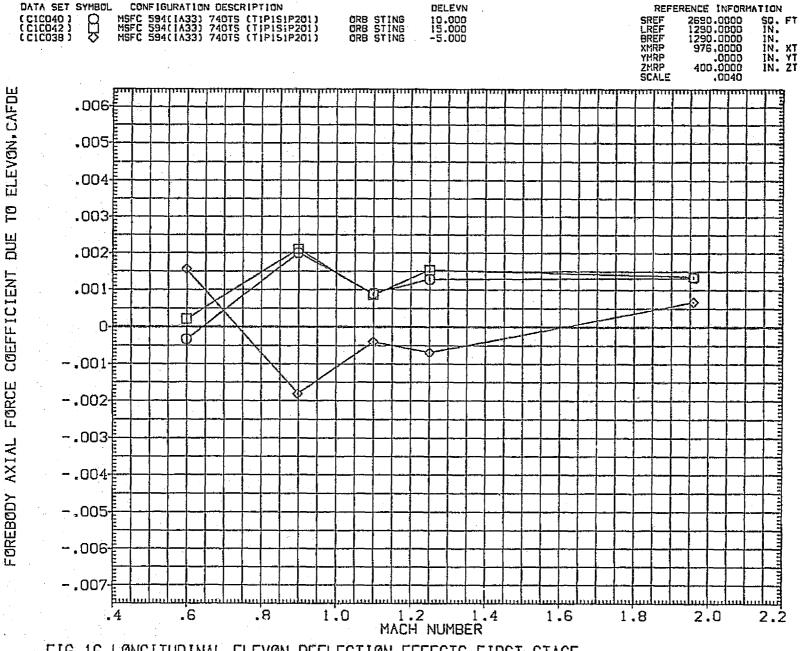


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(H)ALPHA = 4.00

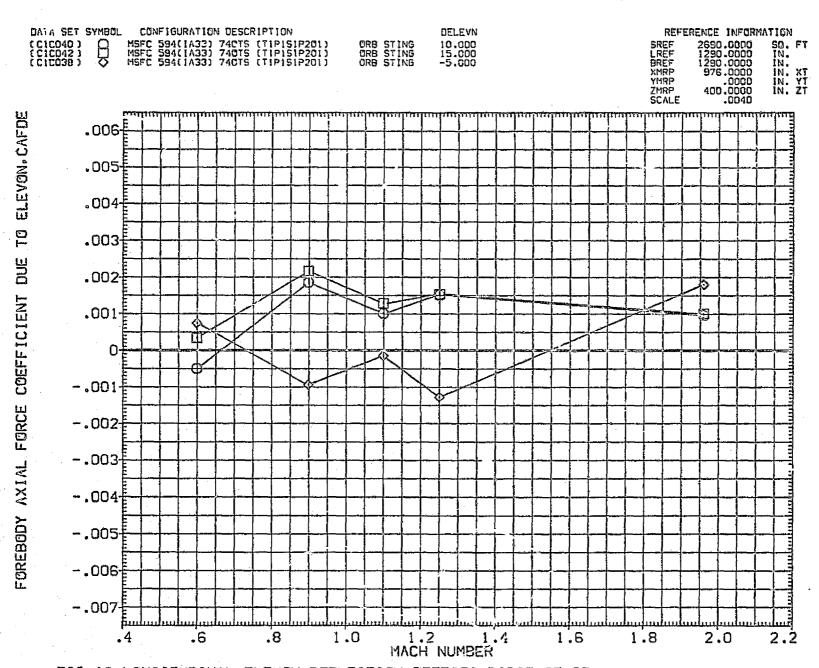


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(I)ALPHA = 6.00

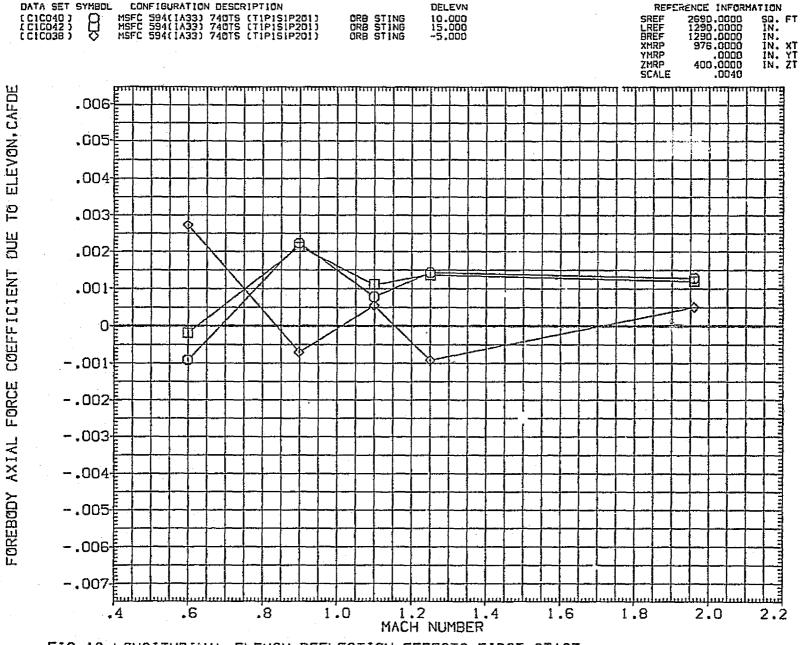


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(J)ALPHA = 8.00

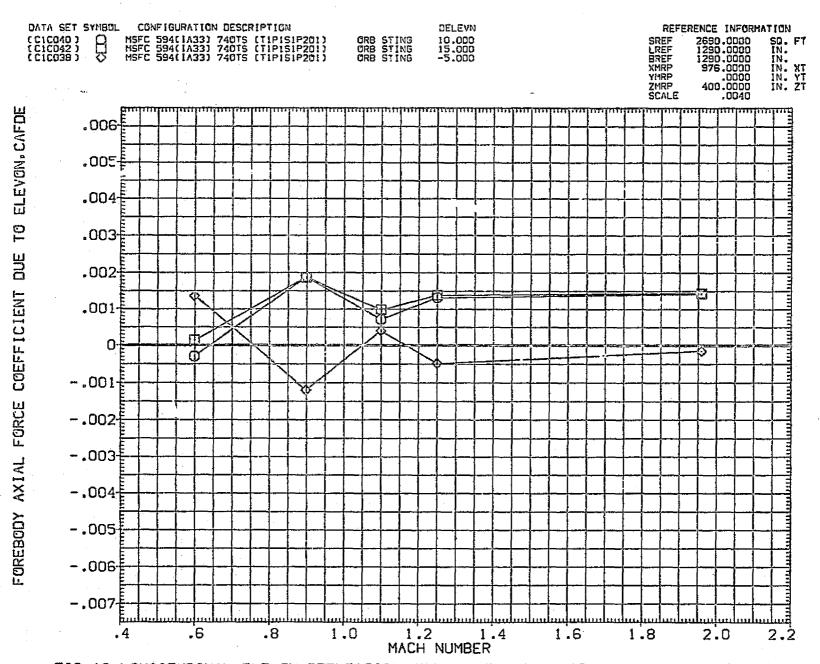
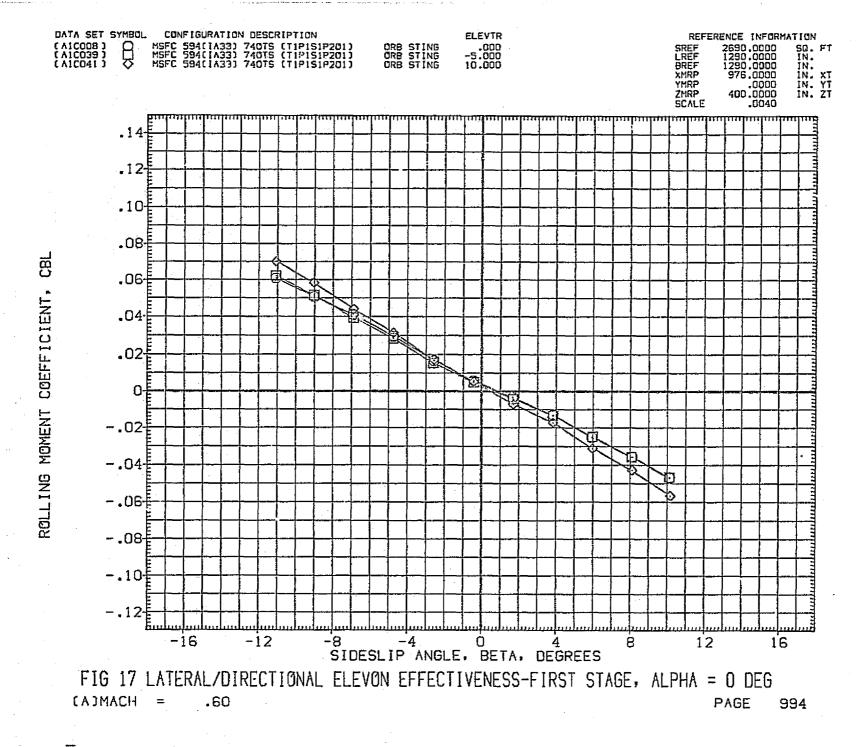


FIG 16 LONGITUDINAL ELEVON DEFLECTION EFFECTS-FIRST STAGE
(K)ALPHA = 10.00



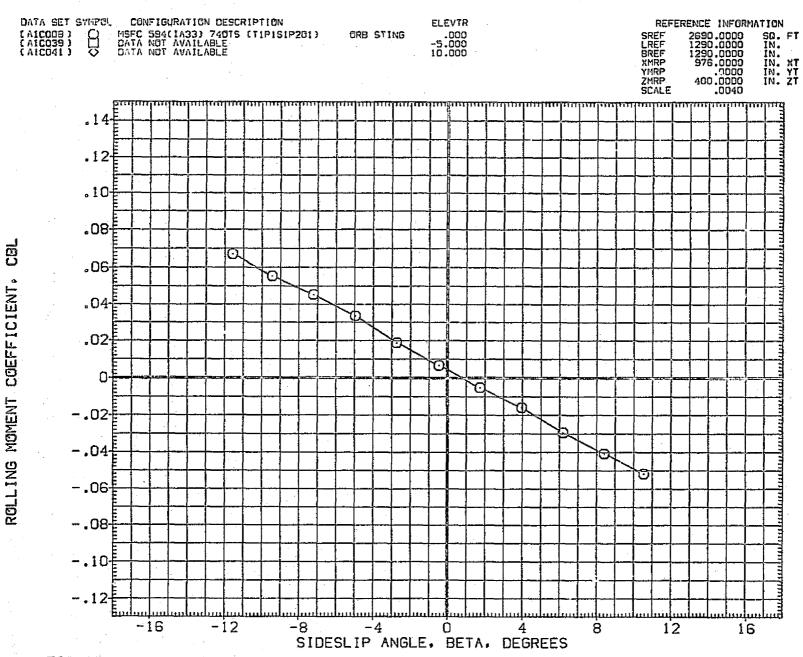
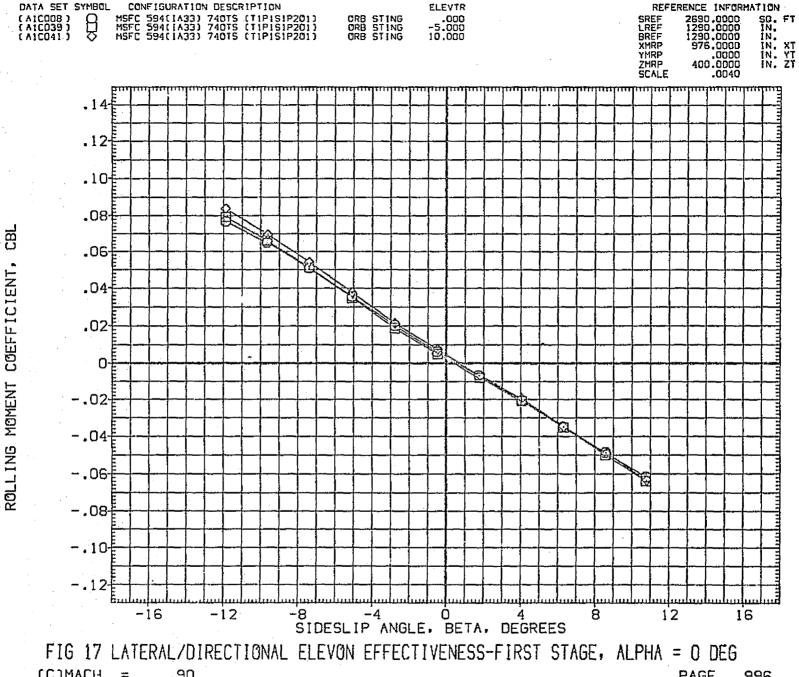


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(B)MACH = .80

PAGE 995



CCOMACH = .90 PAGE 996

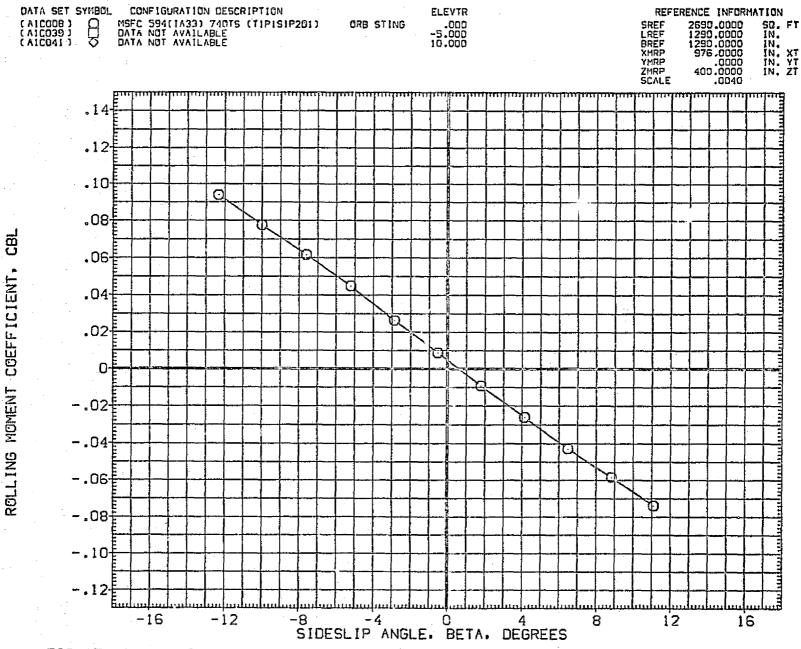
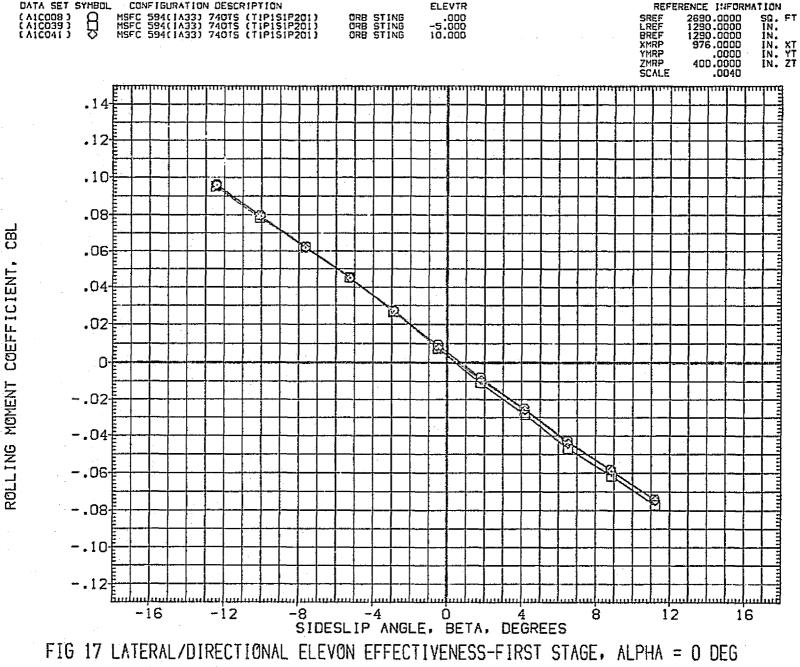


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(D)MACH = 1.05

PAGE 997



(E)MACH = 1.10PAGE 998

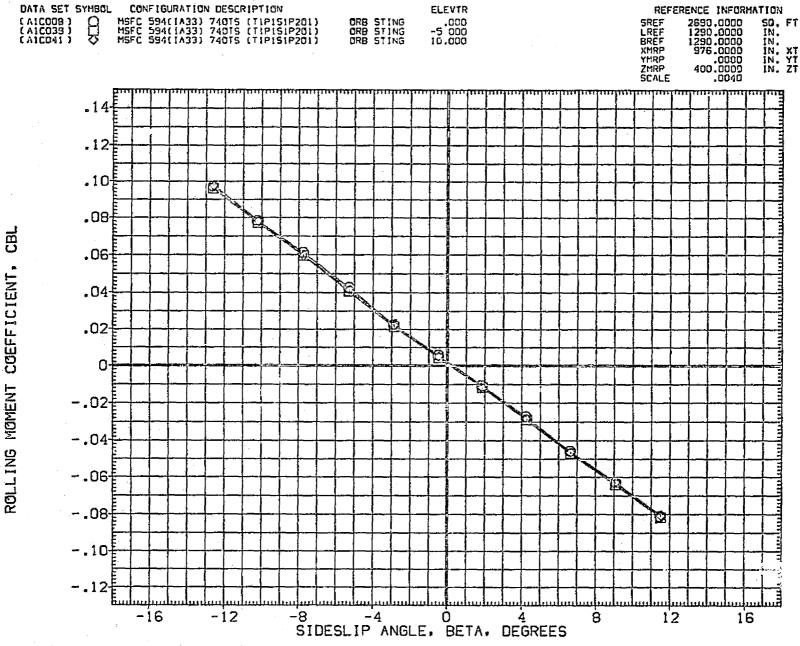


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(F)MACH = 1.25

PAGE 999

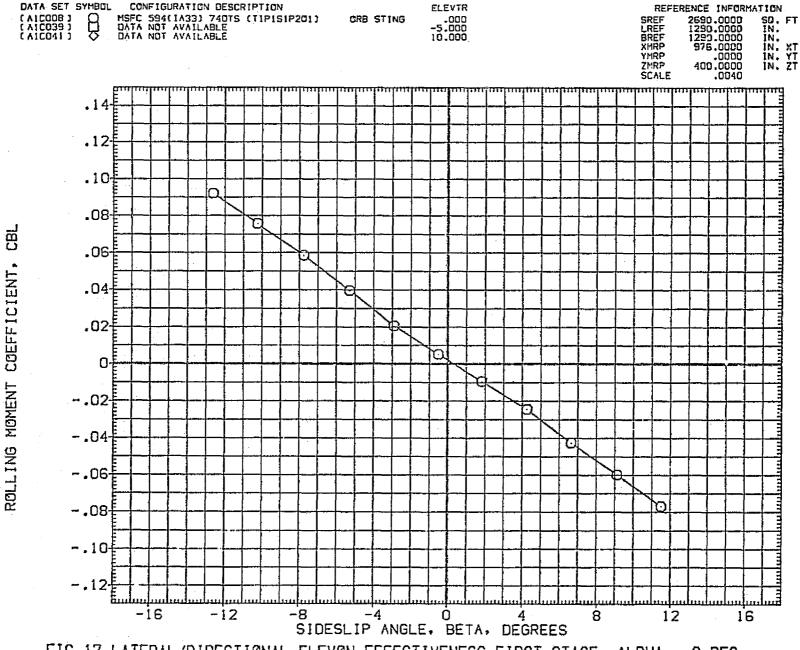


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(G)MACH = 1.47

PAGE 1000

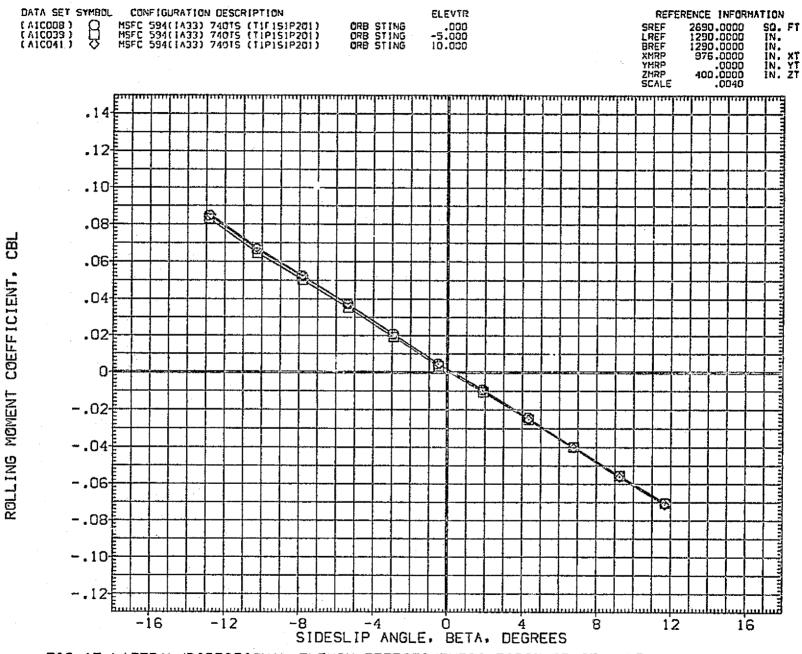


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(H)MACH = 1.97

PAGE 1001

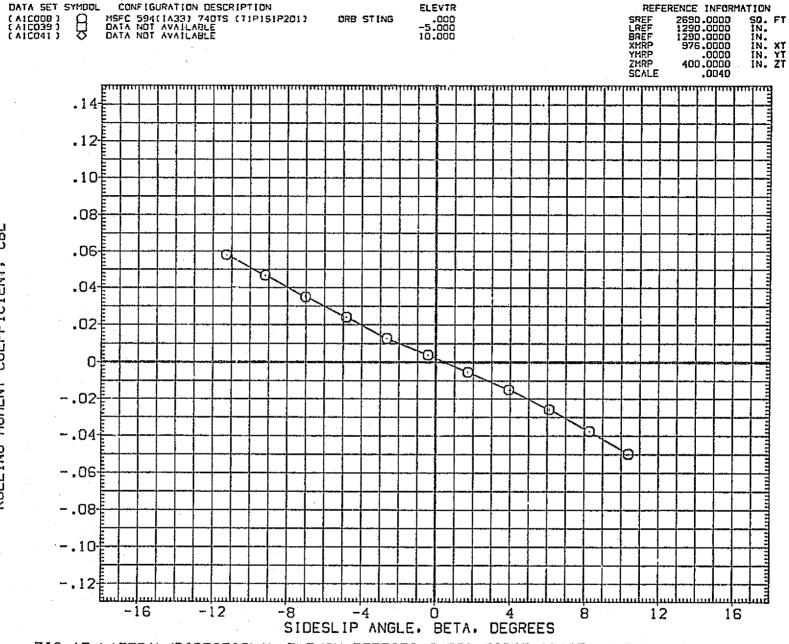


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG
CIOMACH = 2.99
PAGE 1002

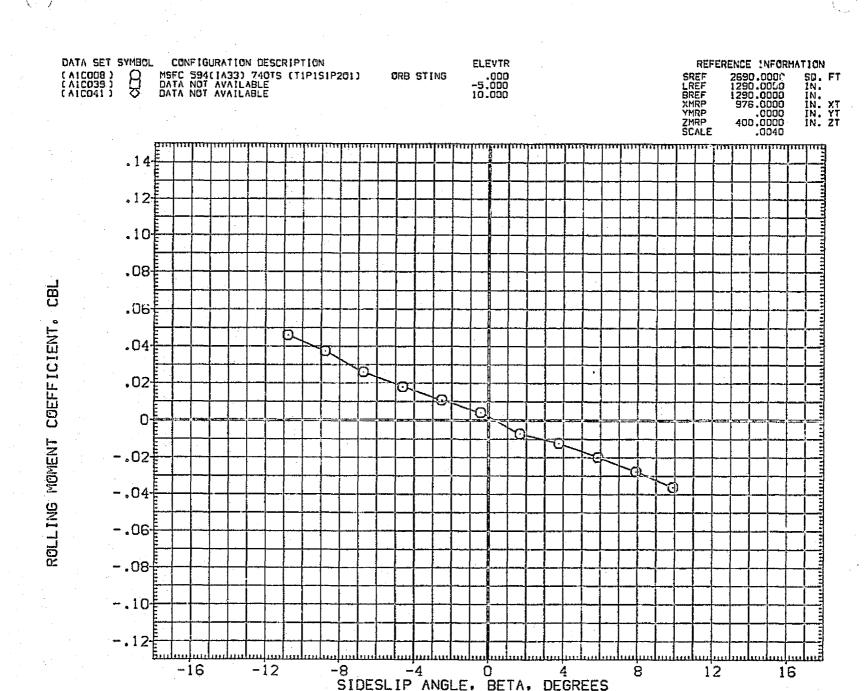


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE. ALPHA = 0 DEG

(J)MACH = 4.96

PAGE 1003

DATA SET SYMBOL CONFIGURATION DESCRIPTION

FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG CADMACH = .60 PAGE 1004

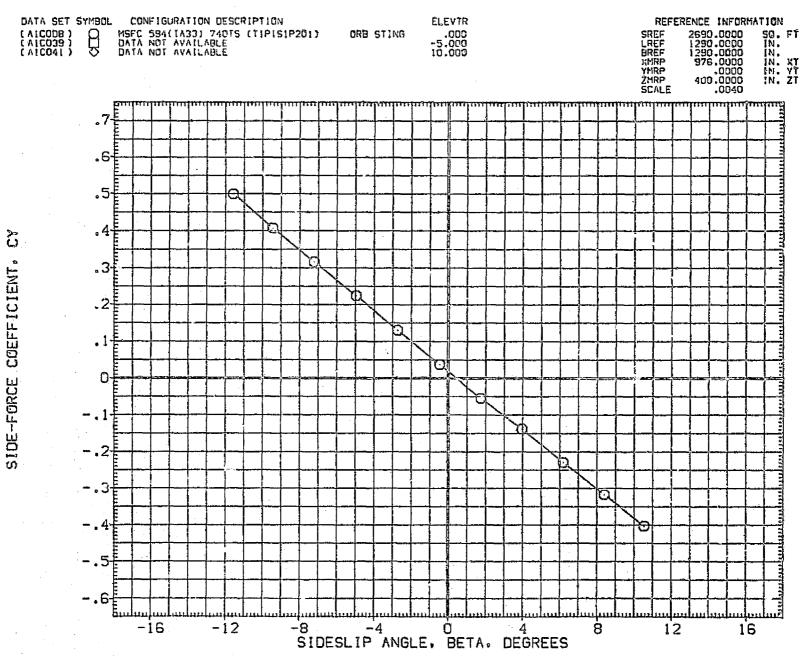
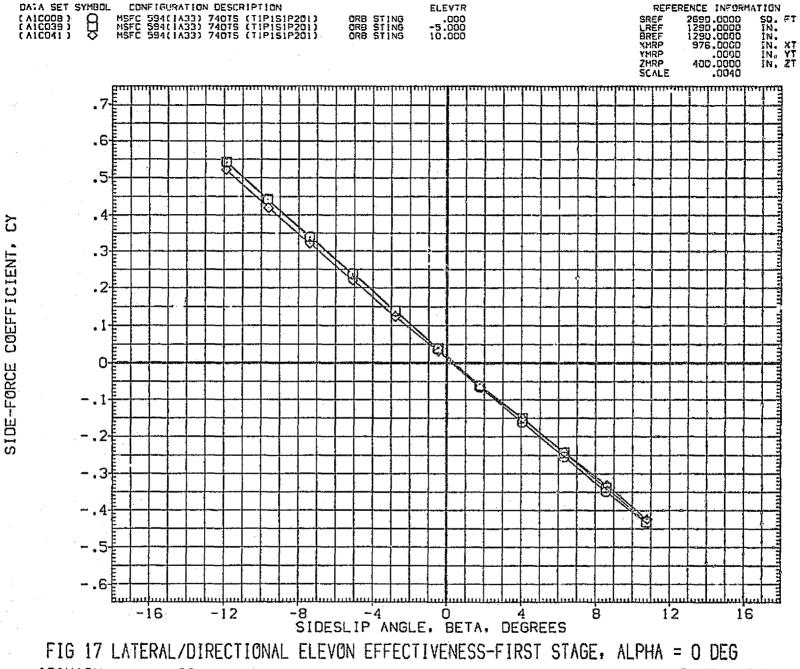


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(B)MACH = .80

PAGE 1005

B



(C)MACH = .90 PAGE 1006

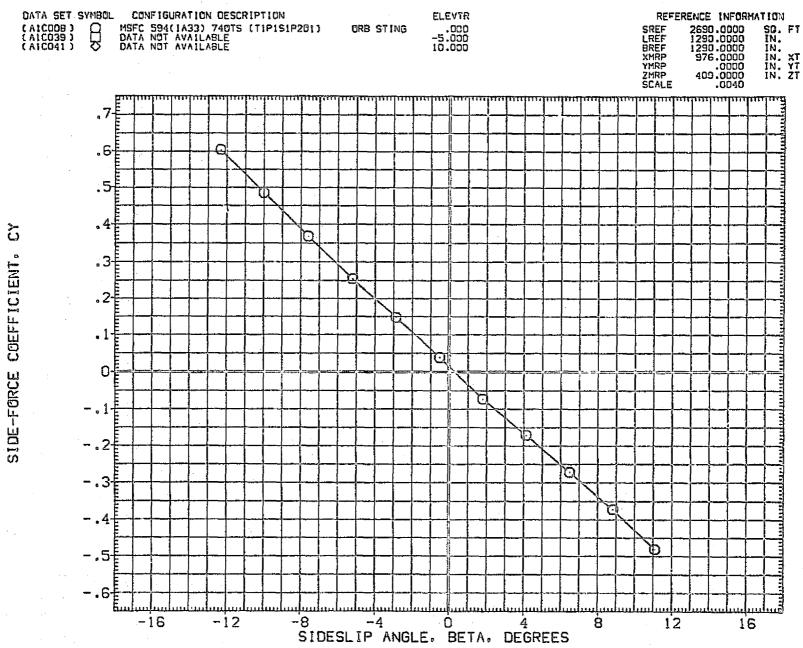


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(D)MACH = 1.05

PAGE 1007

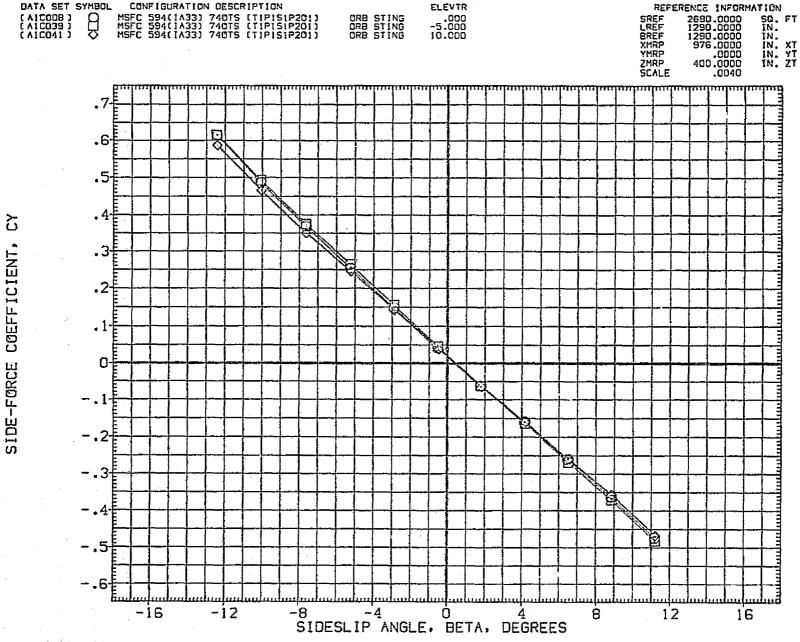


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(E)MACH = 1.10

PAGE 1008

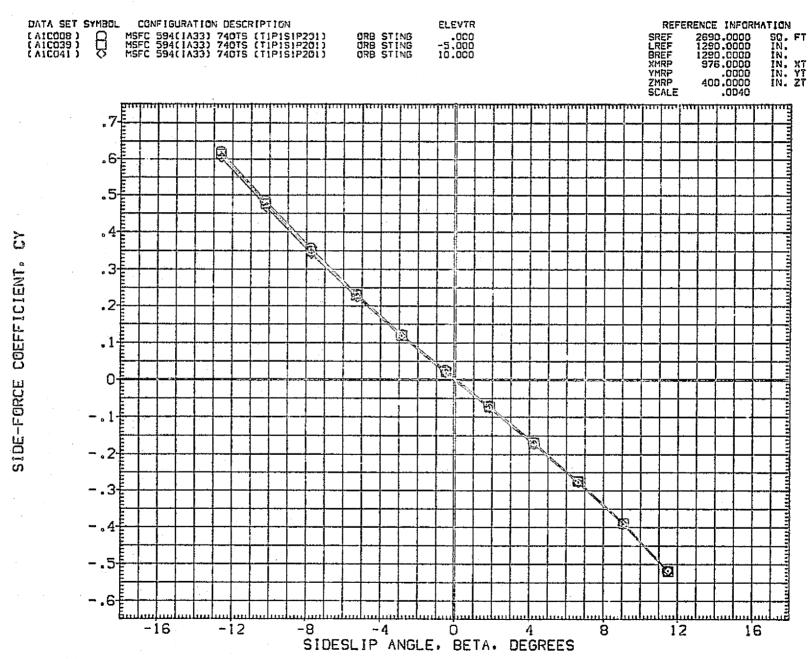


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(F)MACH = 1.25

PAGE 1009

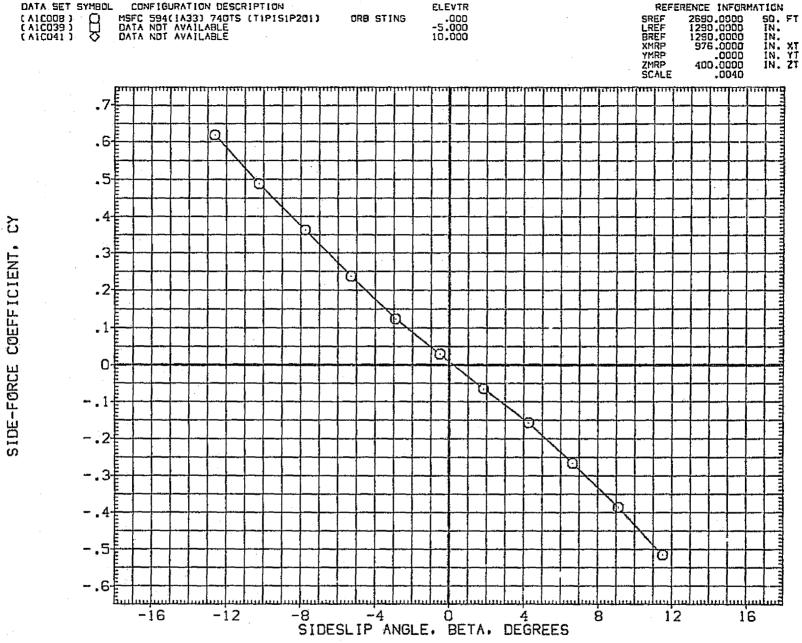


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(G)MACH = 1.47

PAGE 1010

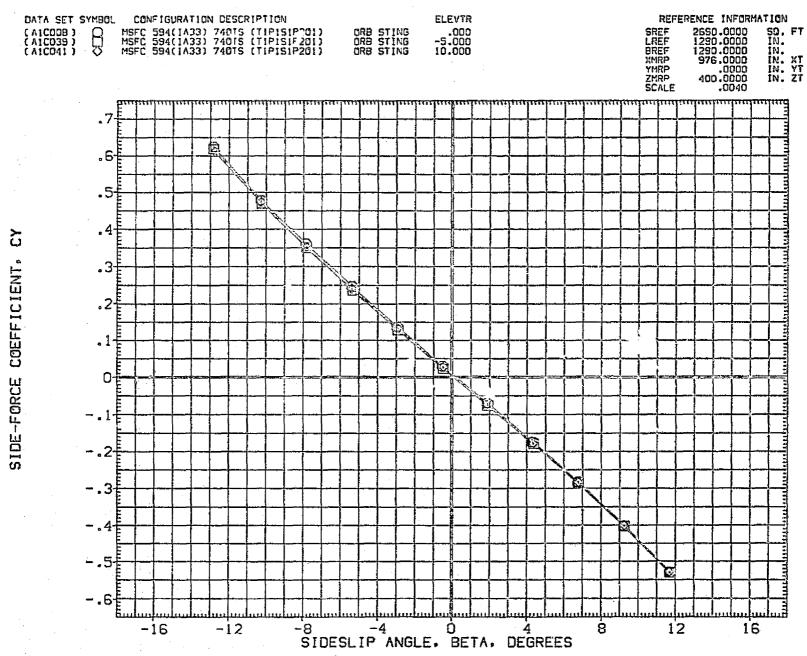
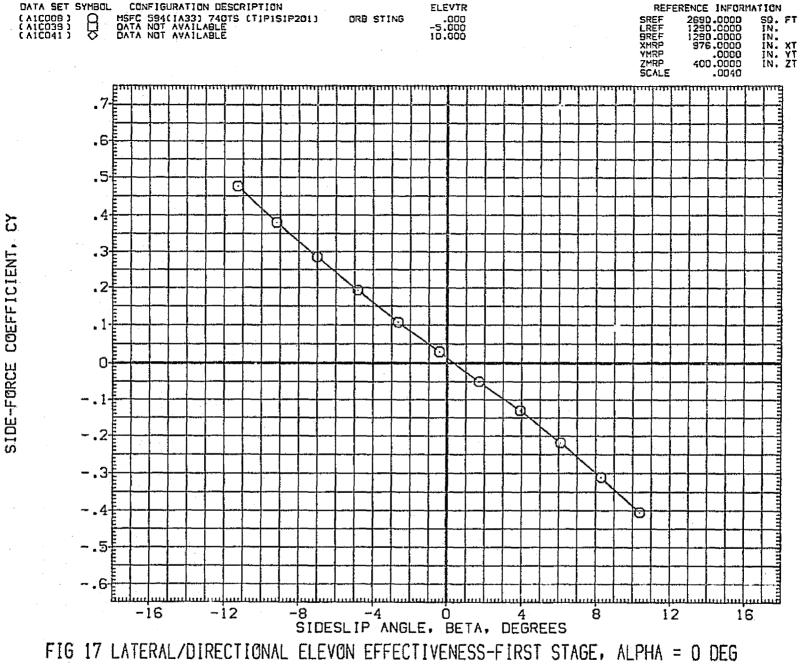


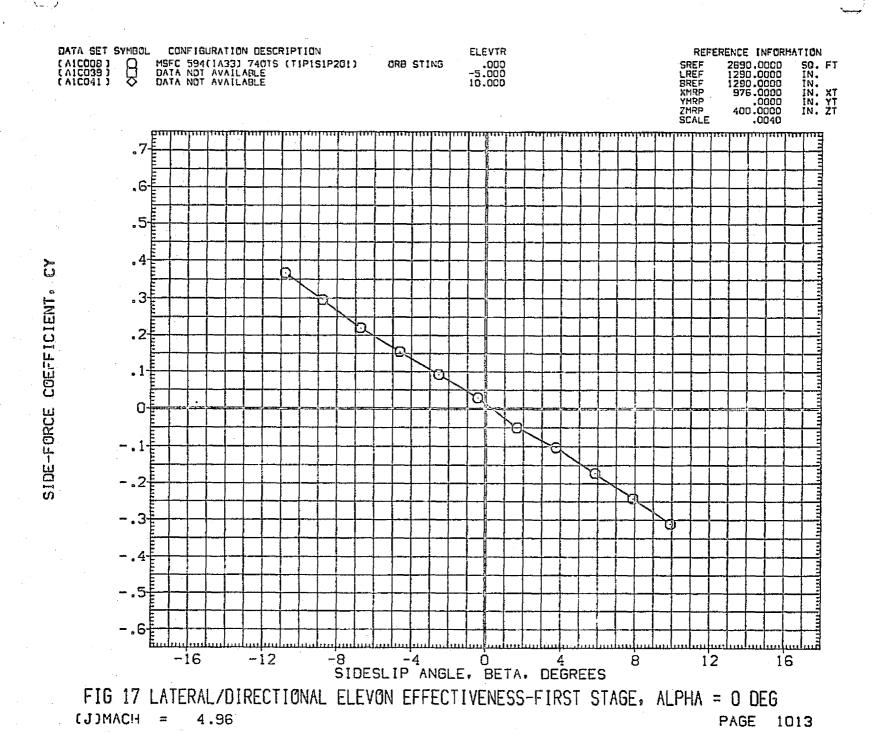
FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(H)MACH = 1.97

PAGE 1011



(I)MACH = 2.99PAGE 1012



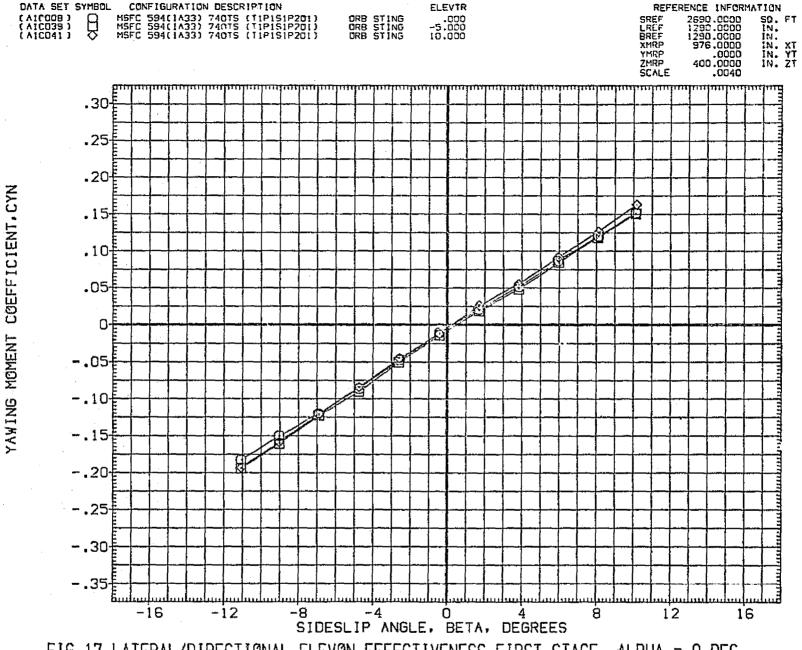


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG
(A)MACH = .60
PAGE 1014

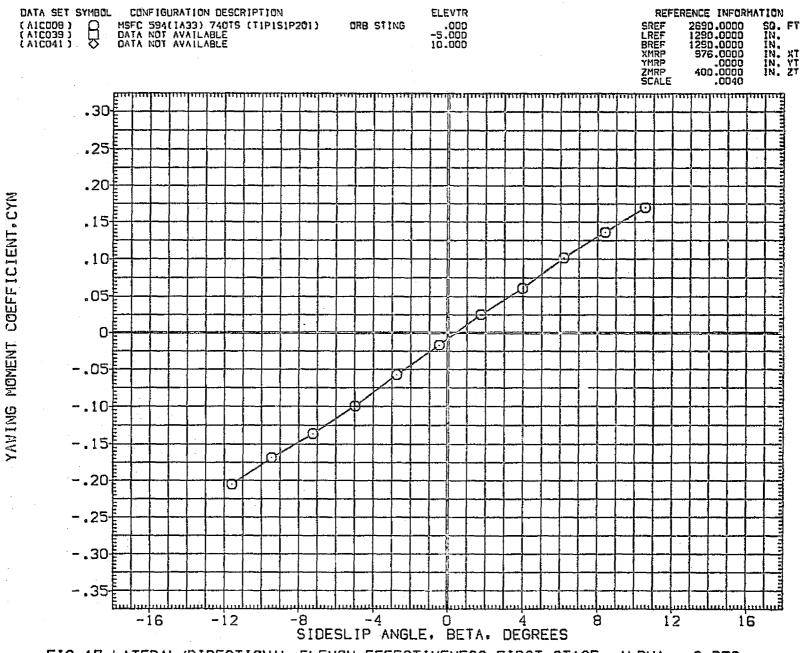


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE. ALPHA = 0 DEG

(B)MACH = .80

PAGE 1015

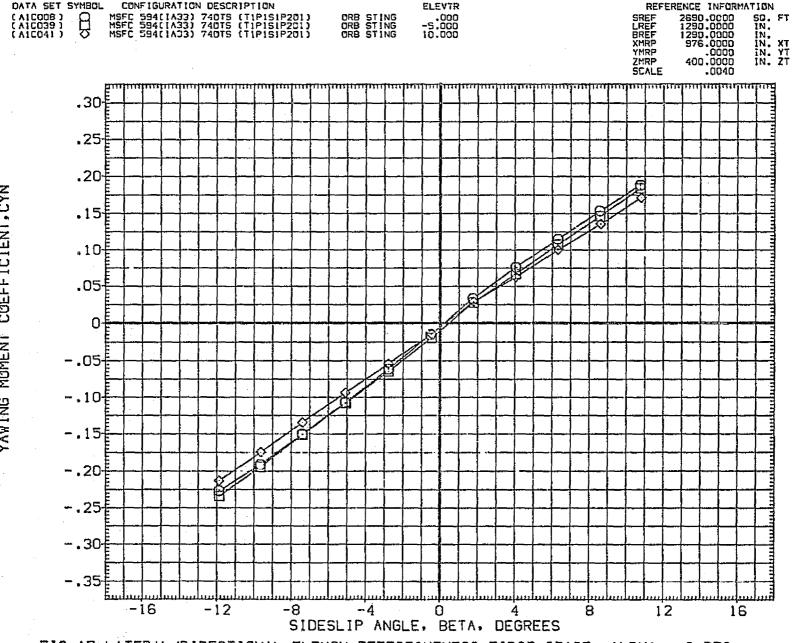


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE. ALPHA = 0 DEG

(C)MACH = .90

PAGE 1016

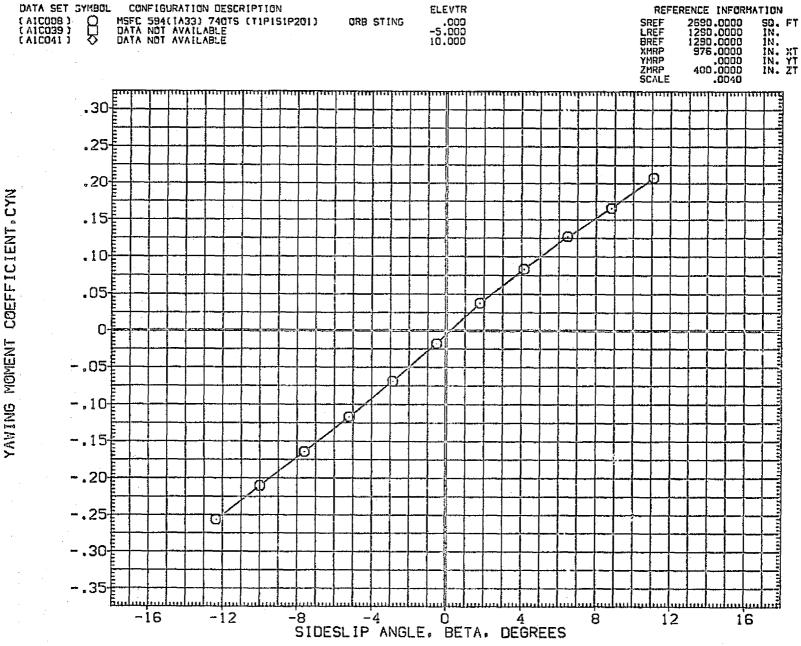
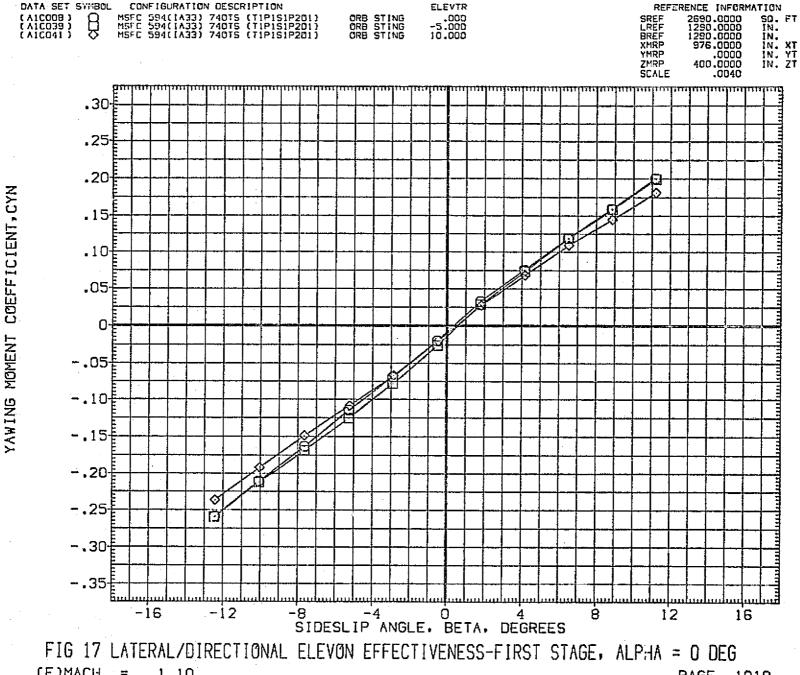


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(D)MACH = 1.05

PAGE 1017



(E)MACH = 1.10PAGE 1018

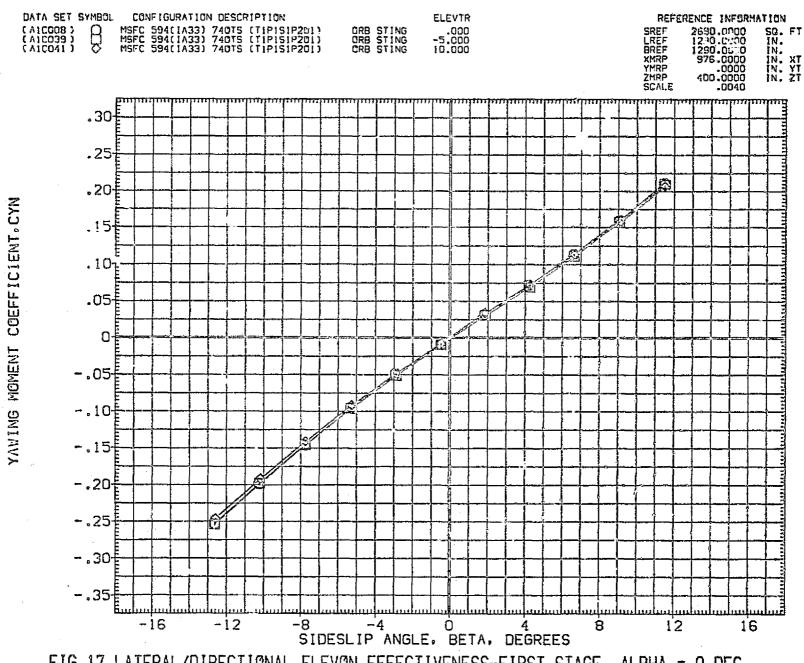


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(F)MACH = 1.25

PAGE 1019

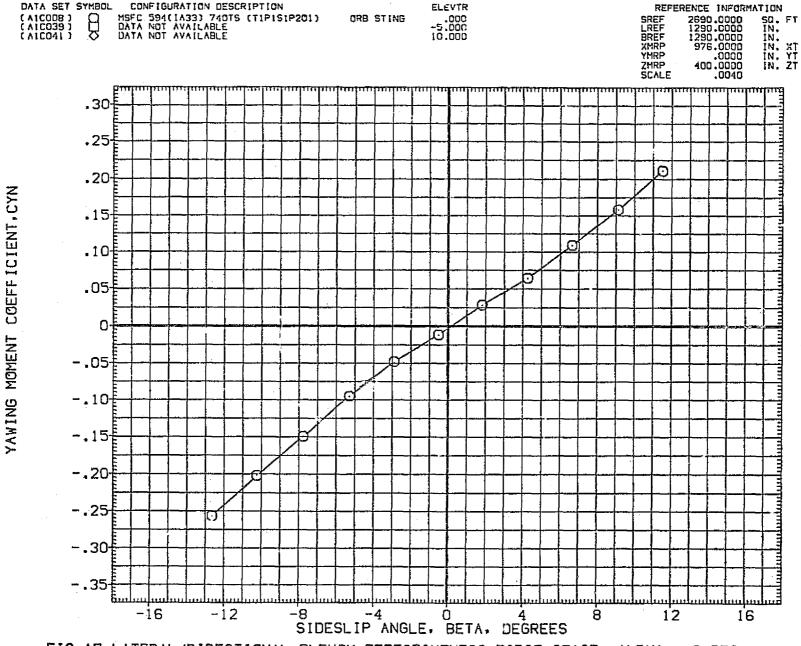
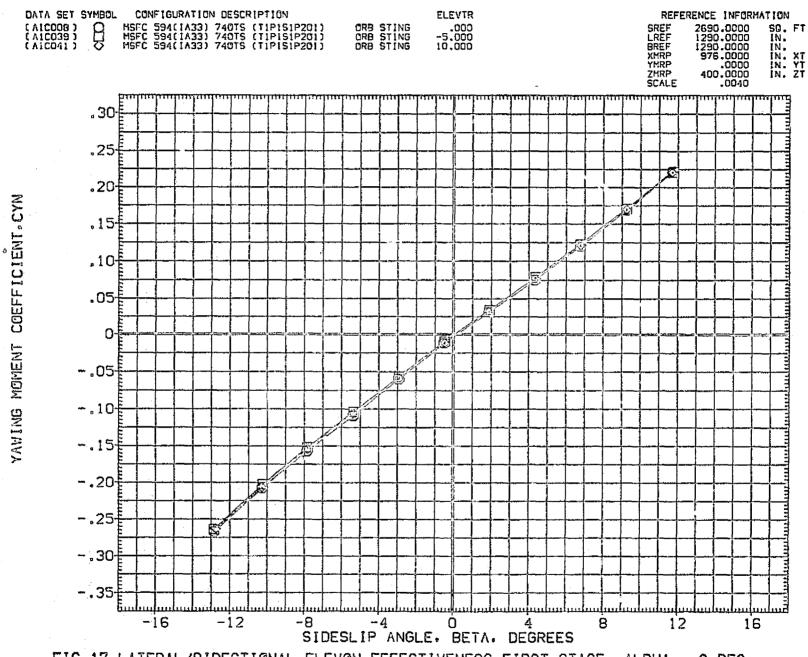


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(G)MACH = 1.47

PAGE 1020

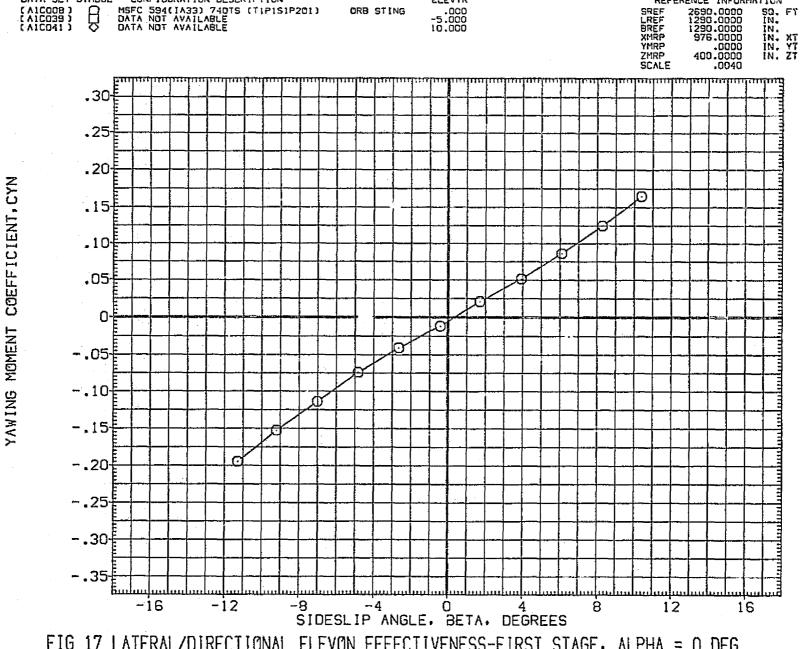


63

FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(H)MACH = 1.97

PAGE 1021



ELEVTR

REFERENCE INFORMATION

DATA SET SYMBOL

CONFIGURATION DESCRIPTION

FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG
(I)MACH = 2.99

PAGE 1022

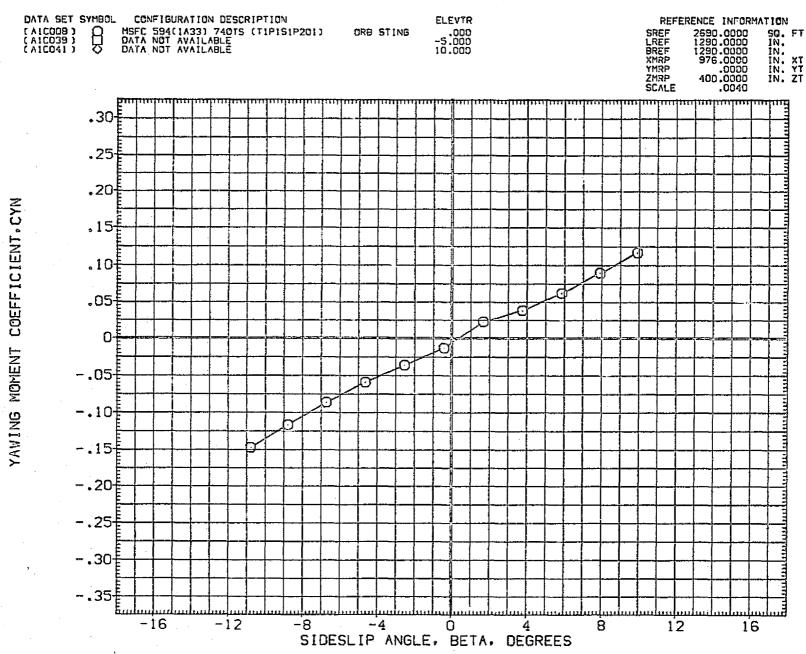


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(J)MACH = 4.96

PAGE 1023

DELEVN

REFERENCE INFORMATION

DATA SET SYMBOL

CONFIGURATION DESCRIPTION

(A)BET $\Lambda = -10.00$ PAGE 1024

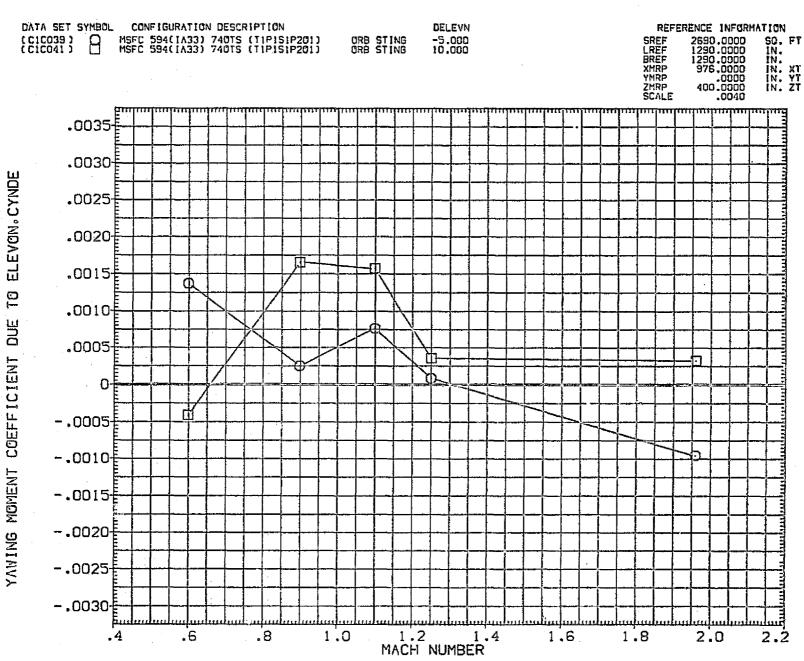
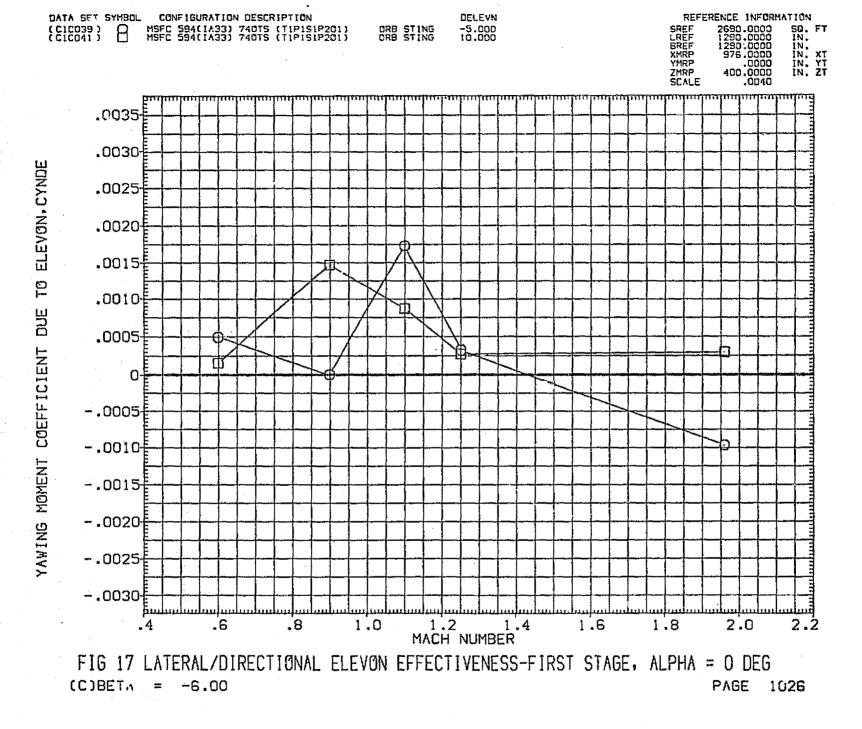


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG
(B)BETA = -8.00
PAGE 1025



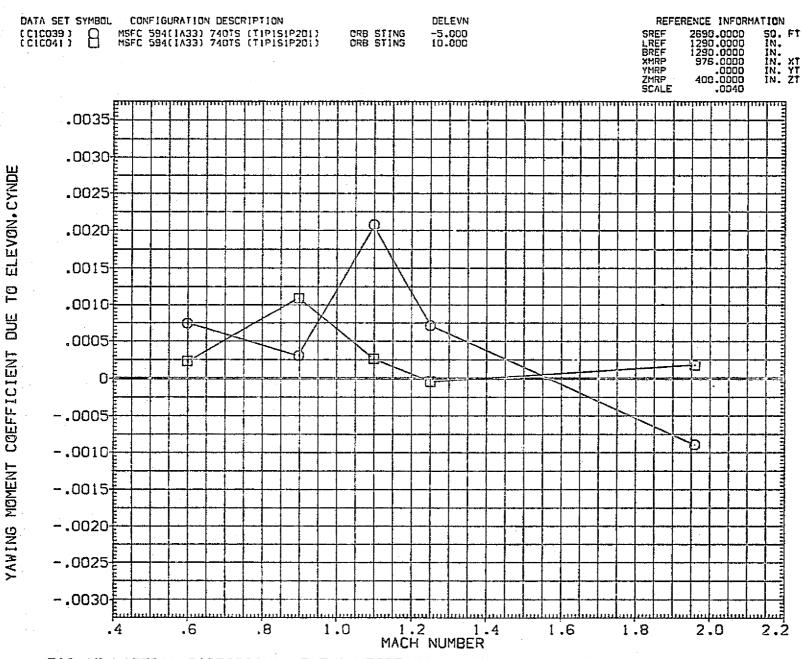
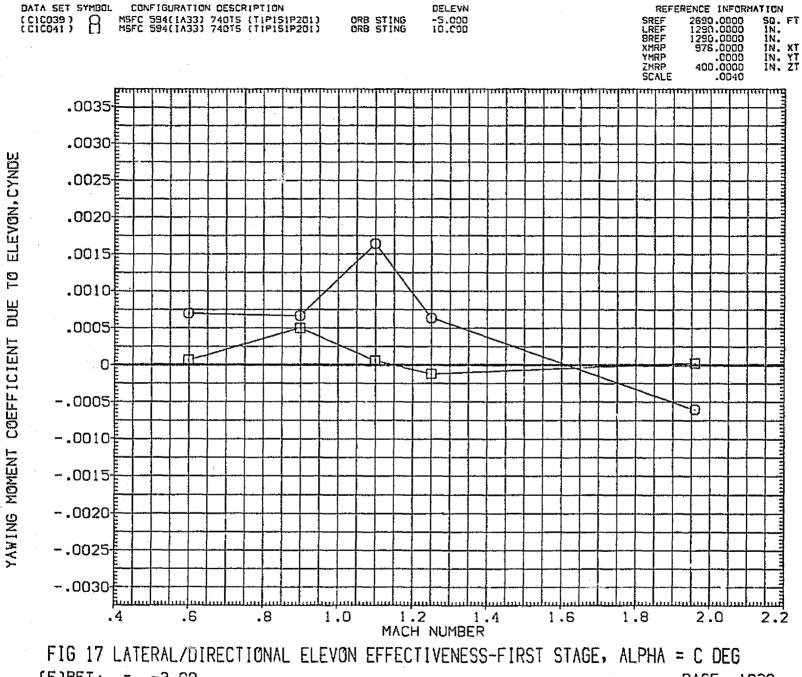


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE. ALPHA = 0 DEG

(D)BETA = -4.00

PAGE 1027



(E)BETA = -2.00PAGE 1028

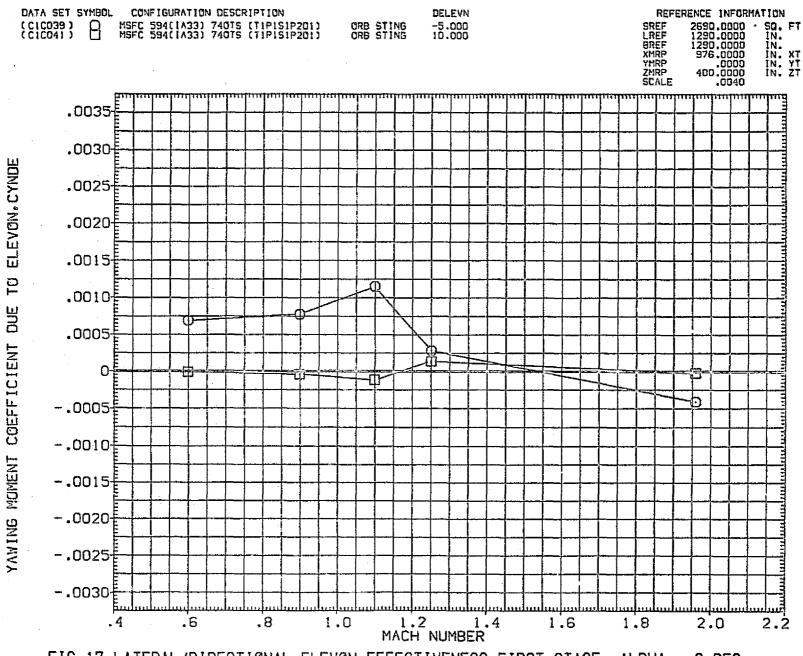
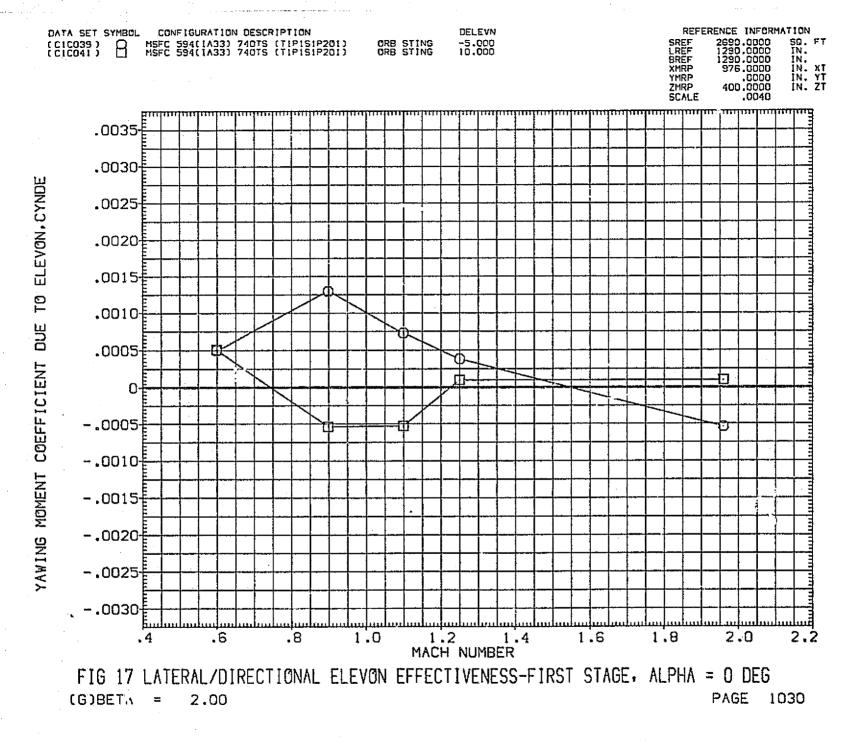


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(F)BETA = .00

PAGE 1029



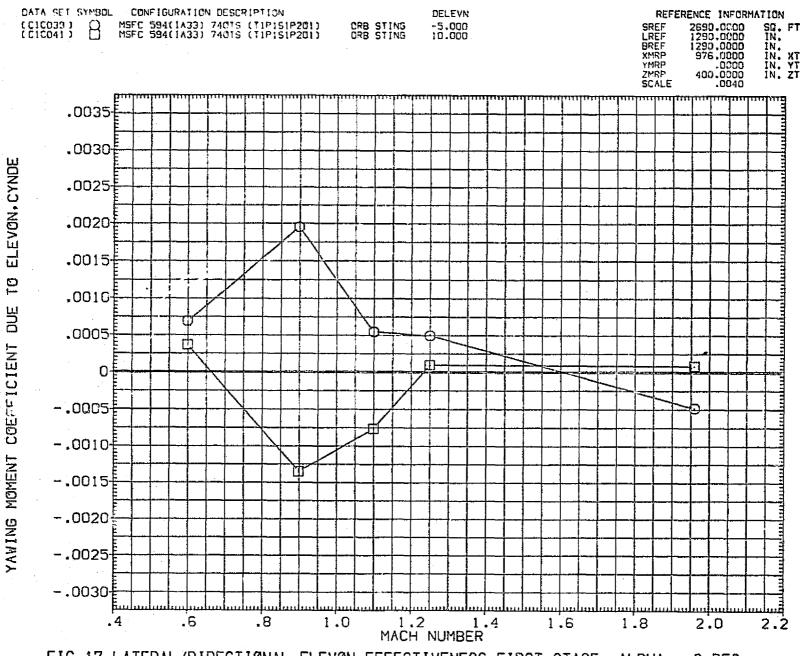


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(H)BETA = 4.00

PAGE 1031

(I)BETA = 6.00 PAGE 1032

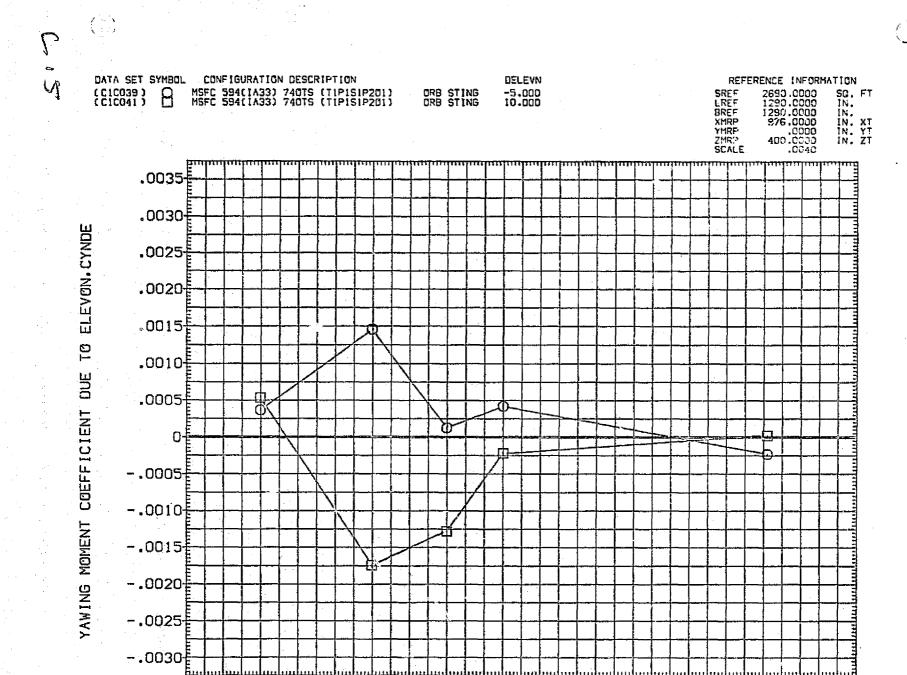


FIG 17 LATERAL/DIRECTIONAL ELEYON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(J)BETA = 8.00

PAGE 1033

1.2

MACH NUMBER

1.4

1.6

1.8

2.0

.8

.6

1.0

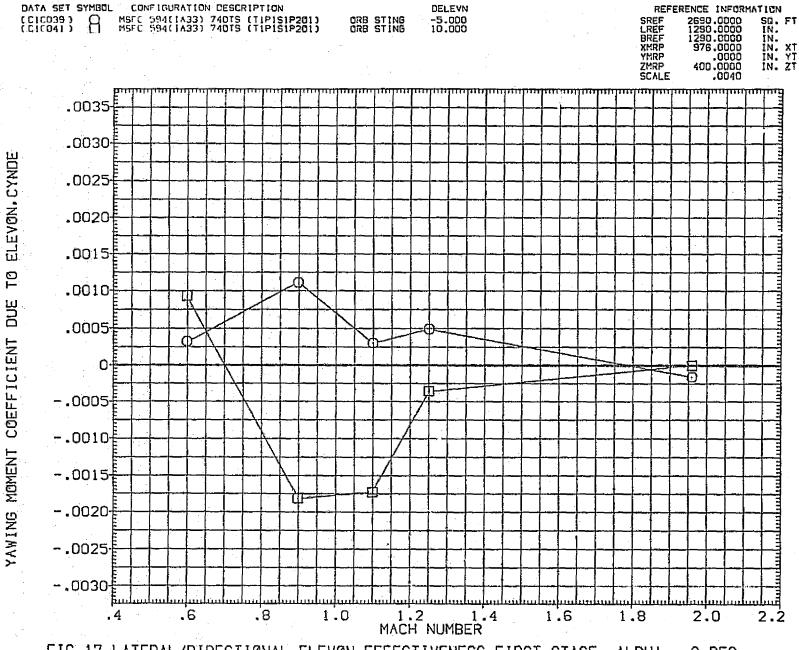


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG (K)BETA = 10.00 PAGE 1034

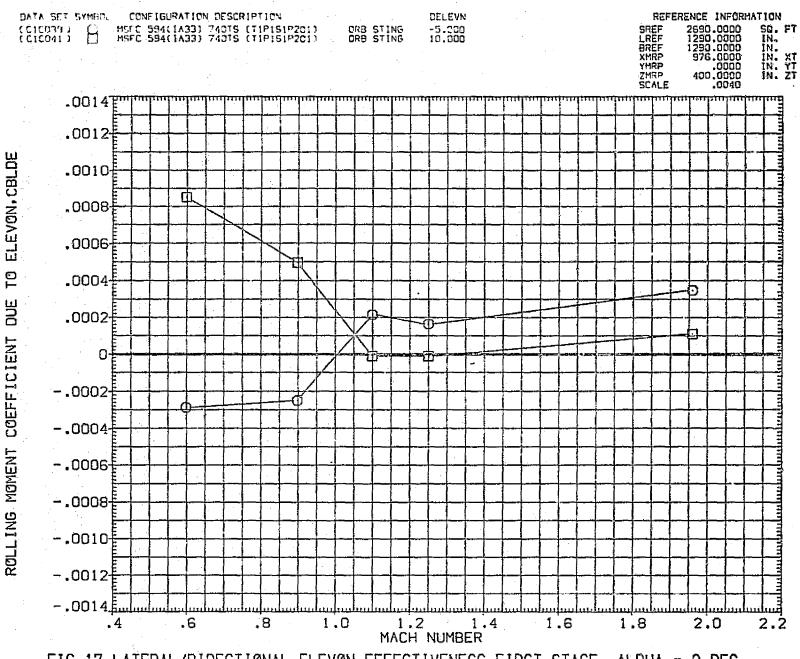
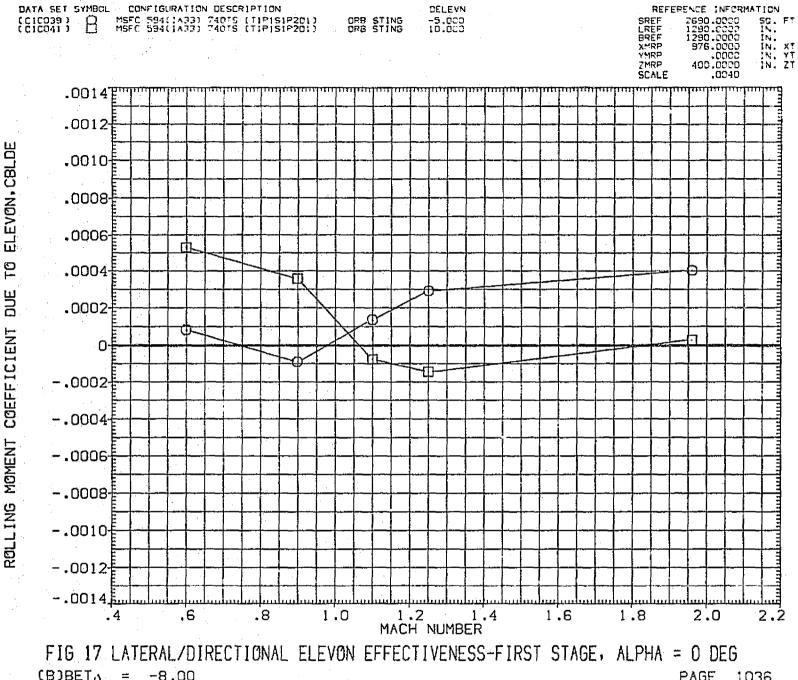


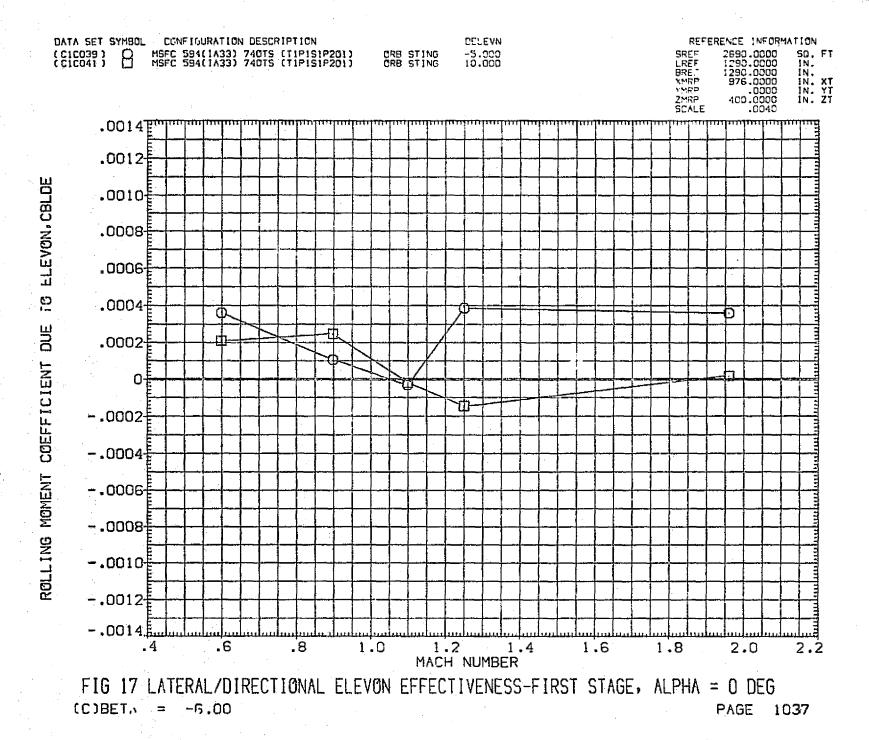
FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

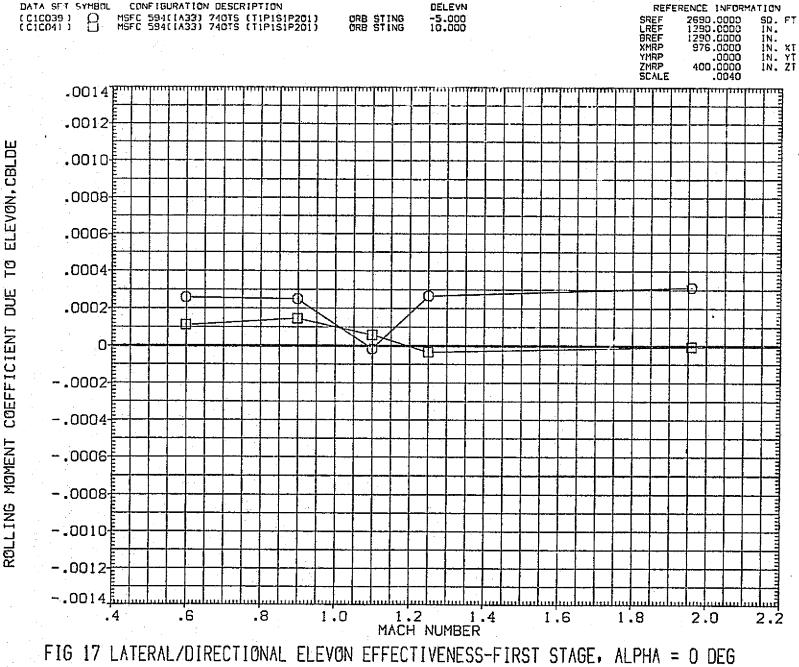
(A)BETA = -10.00

PAGE 1035

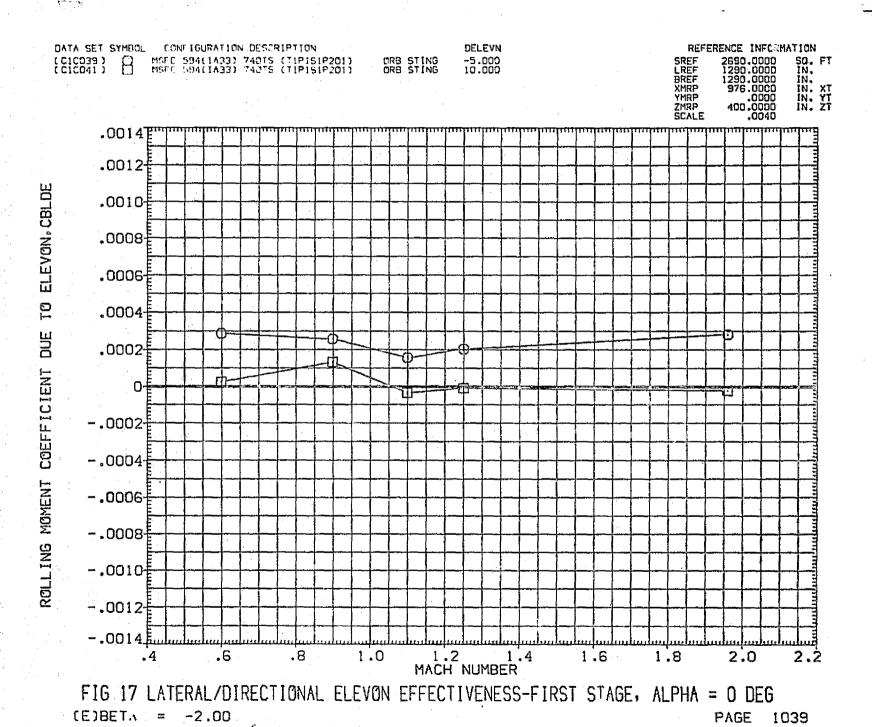


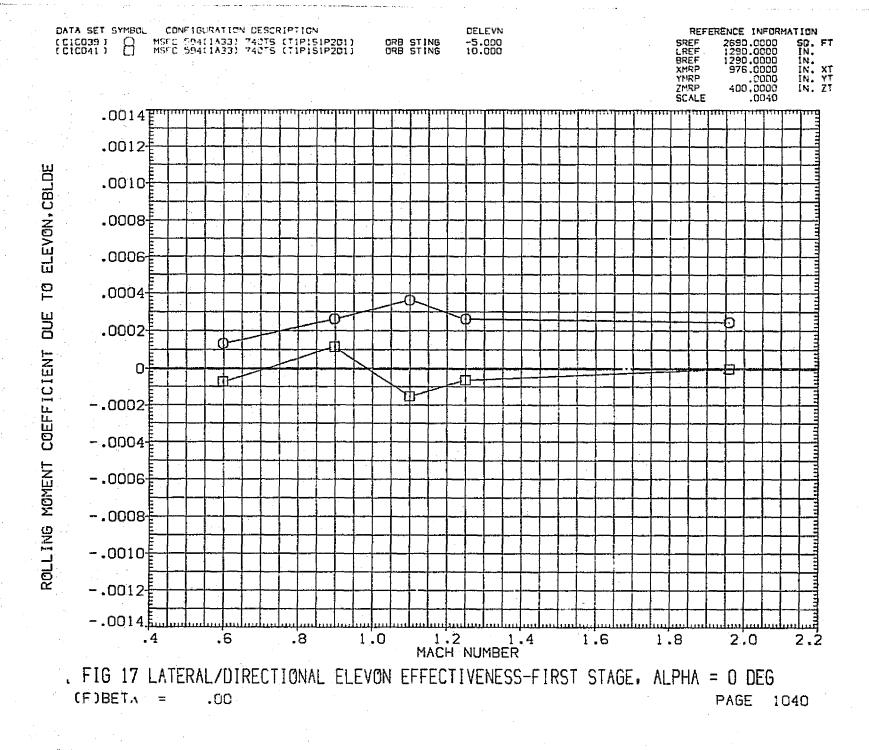
(B)BETA = -8.00PAGE 1036





(D)BETA = -4.00PAGE 1038





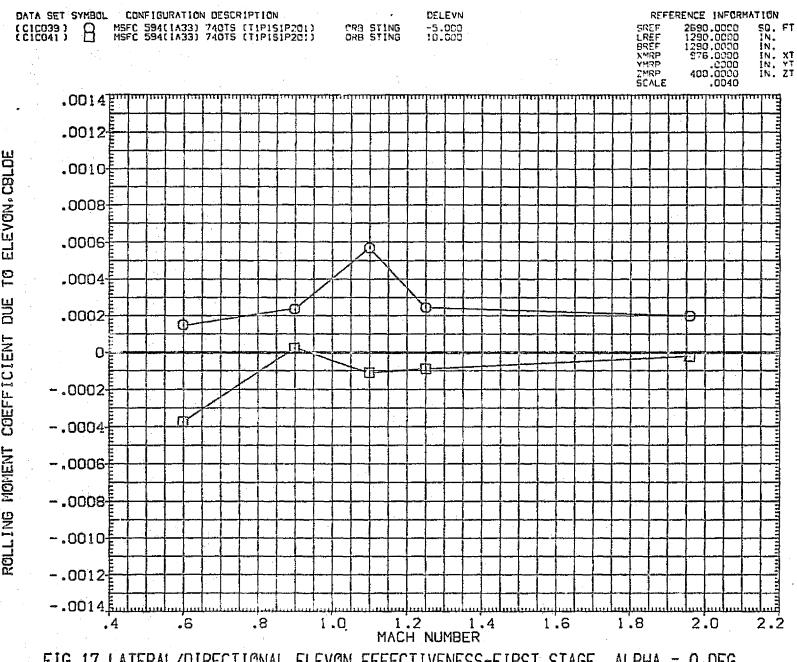
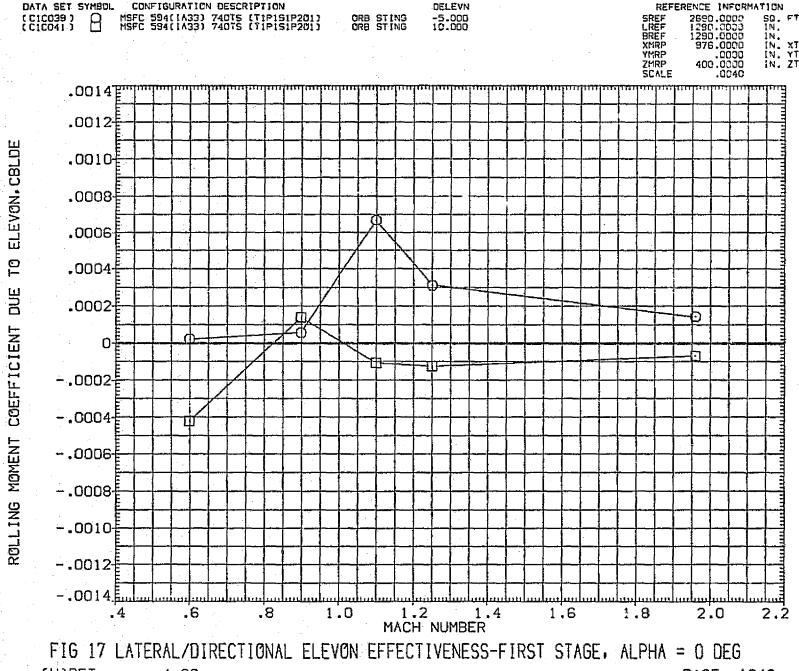


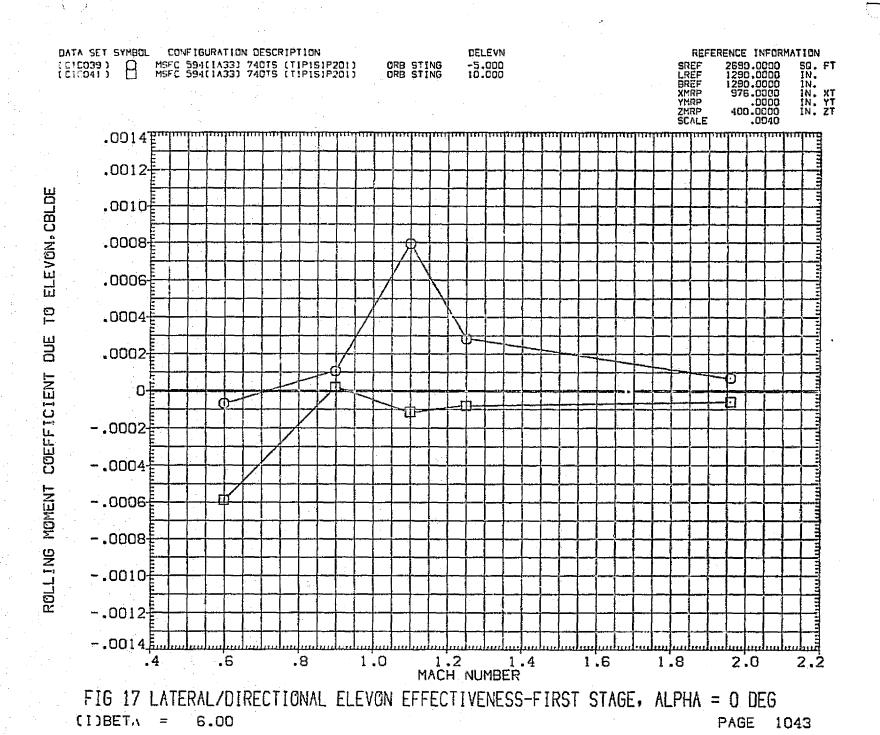
FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

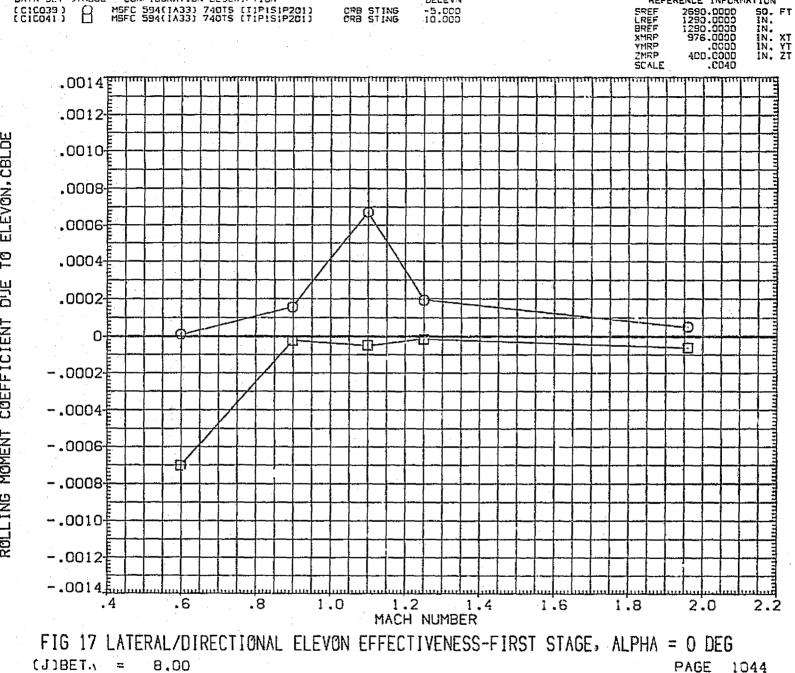
(G)BETA = 2.00

PAGE 1041



(H)BET $\Lambda = 4.00$ PAGE 1042





DATA SET SYMBOL CONFIGURATION DESCRIPTION

PAGE 1044

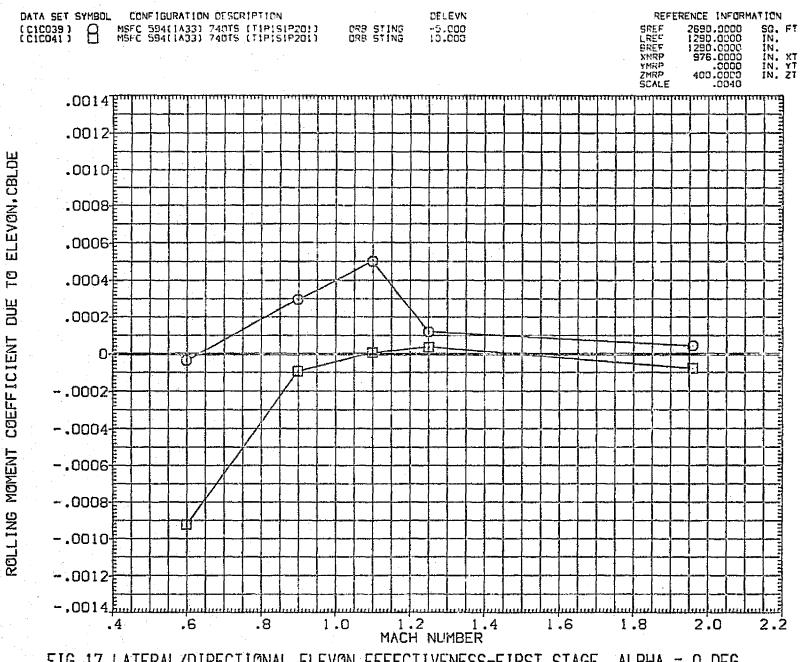
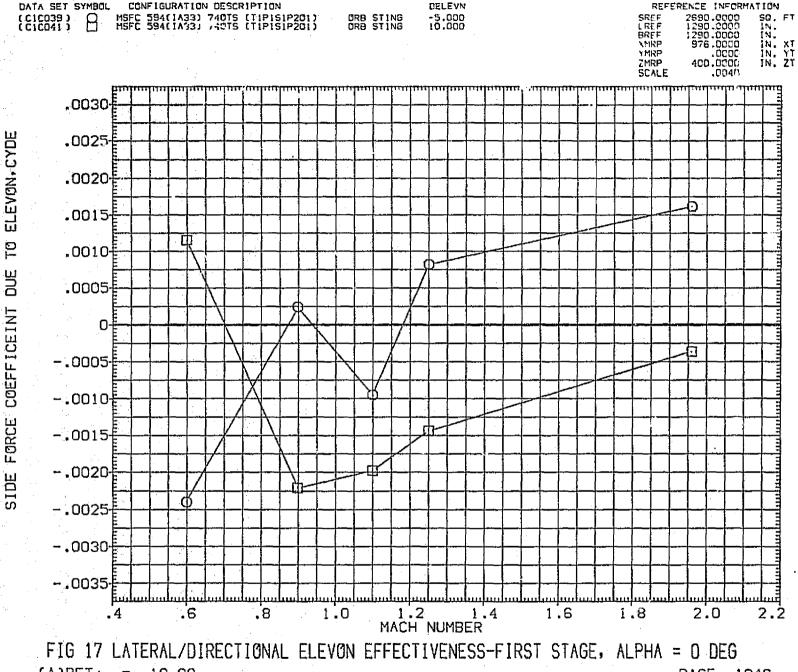


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(K)BETA = 10.00

PAGE 1045



(A)BETA = -10.00PAGE 1046

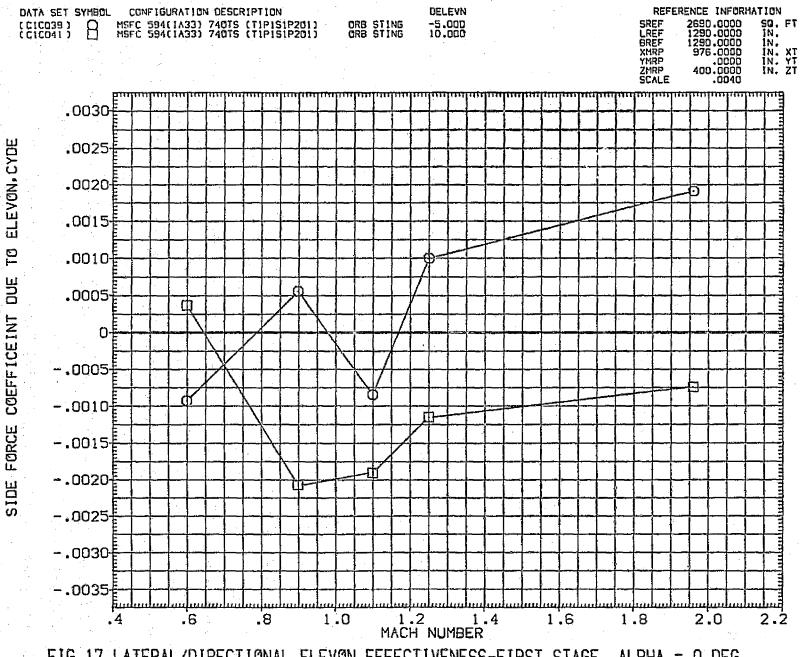


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(B)BETA = -8.00

PAGE 1047

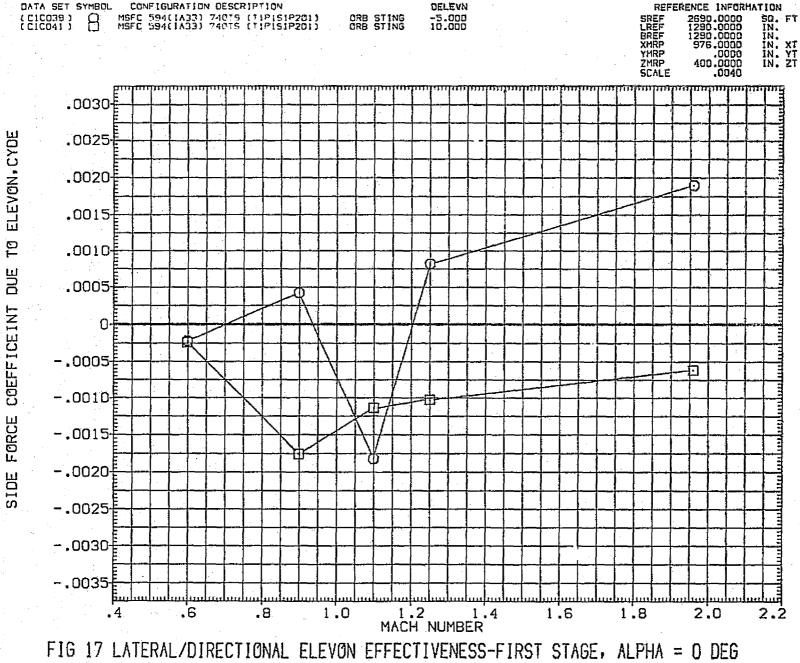


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(C)BETA = -6.00

PAGE 1048

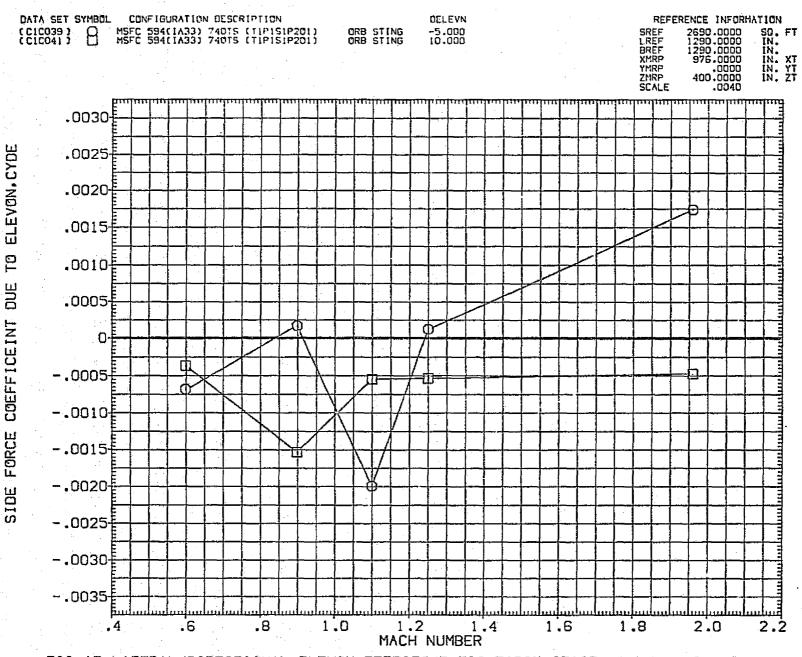


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(D)BETA = -4.00

PAGE 1049

FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

(E)BETA = -2.00

PAGE 1050

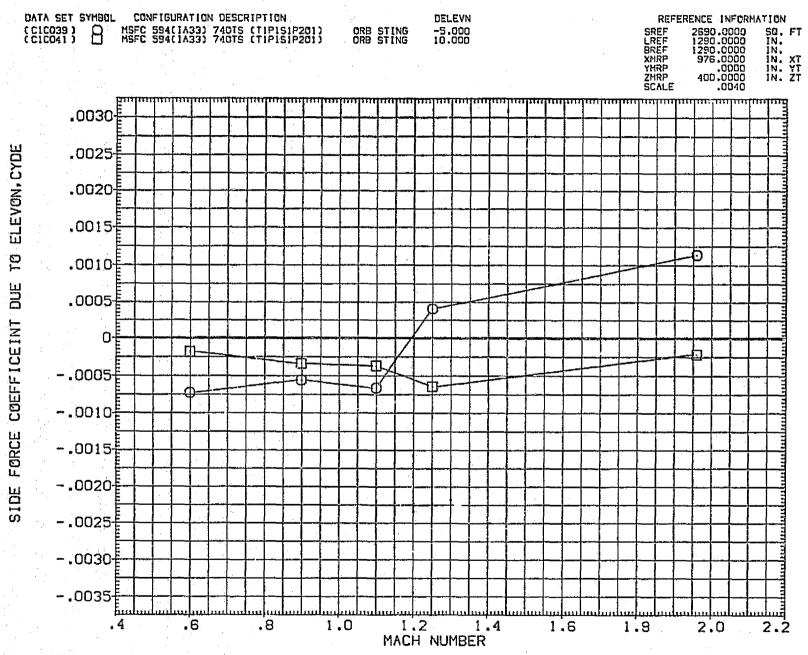


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

DATA SET SYMBOL CONFIGURATION DESCRIPTION

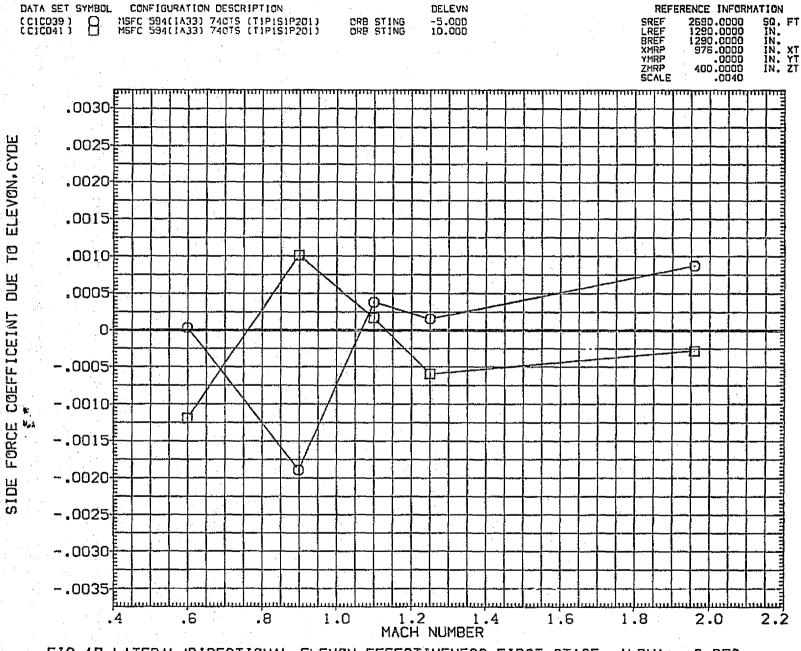
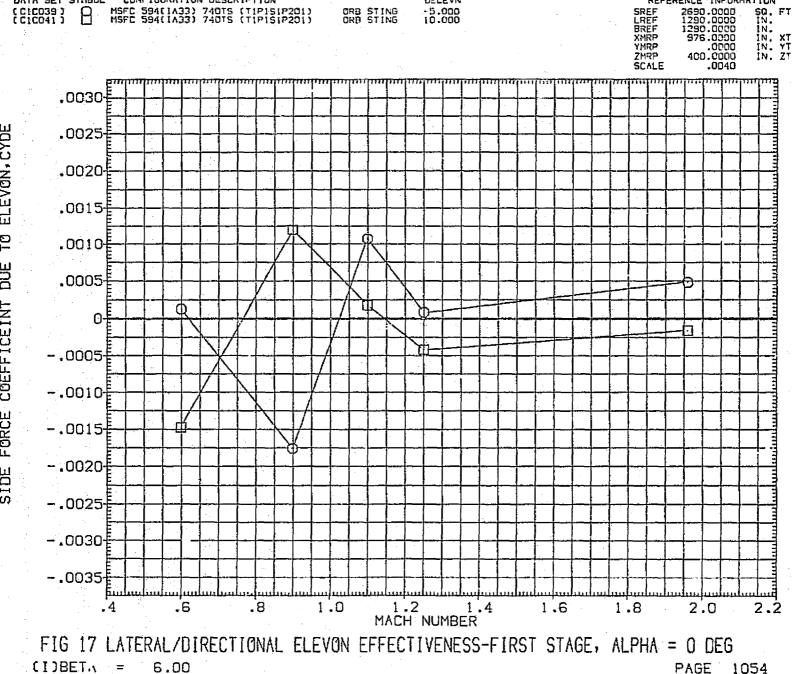


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG
(H)BETA = 4.00
PAGE 1053



DATA SET SYMBOL CONFIGURATION DESCRIPTION

PAGE 1054

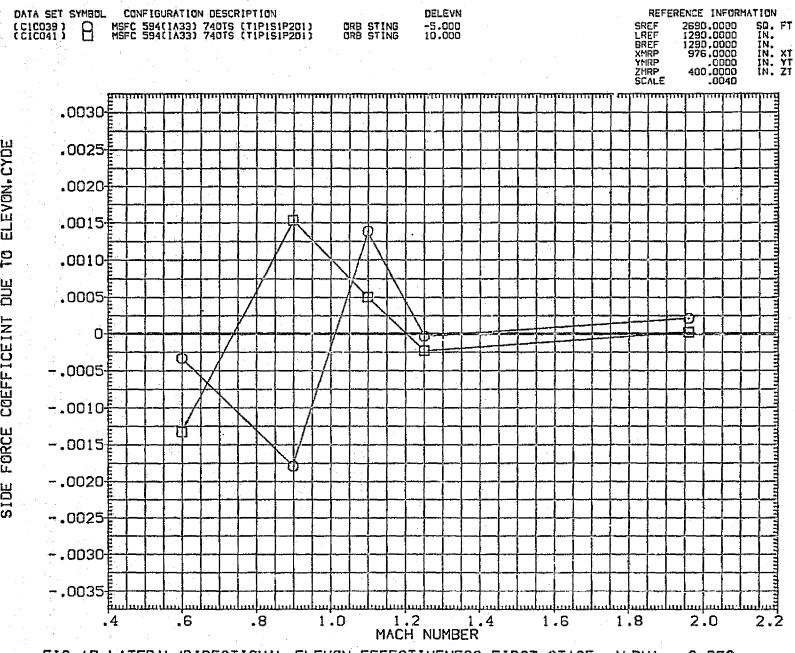


FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

CJOBETA = 8.00

PAGE 1055

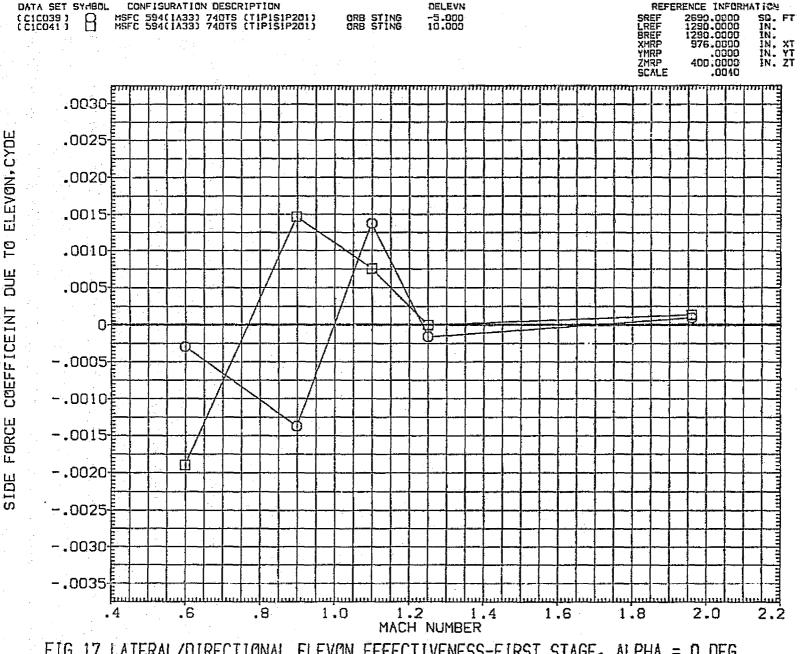
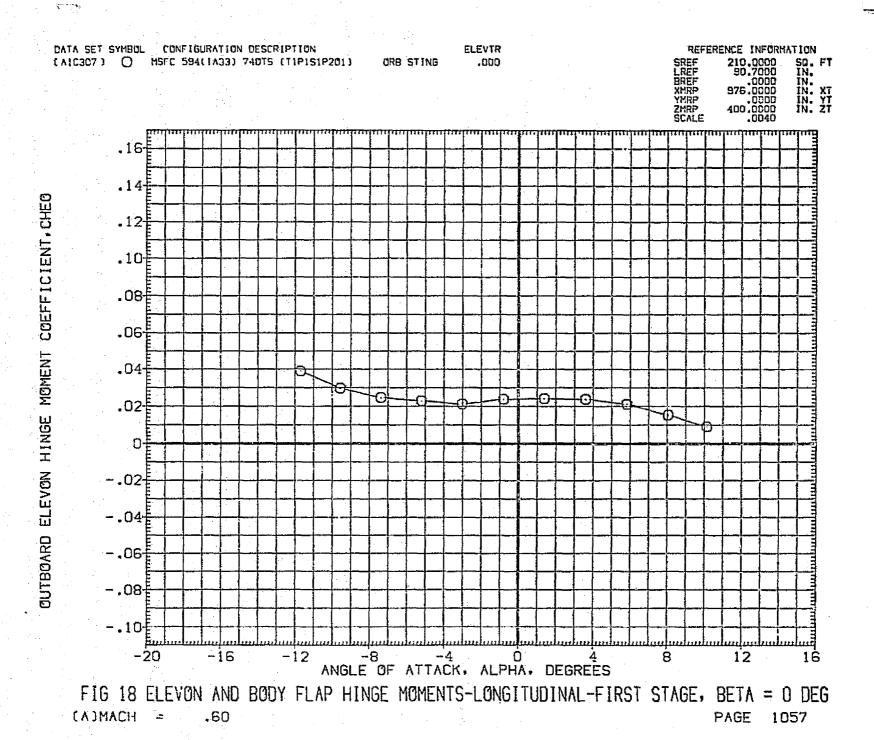


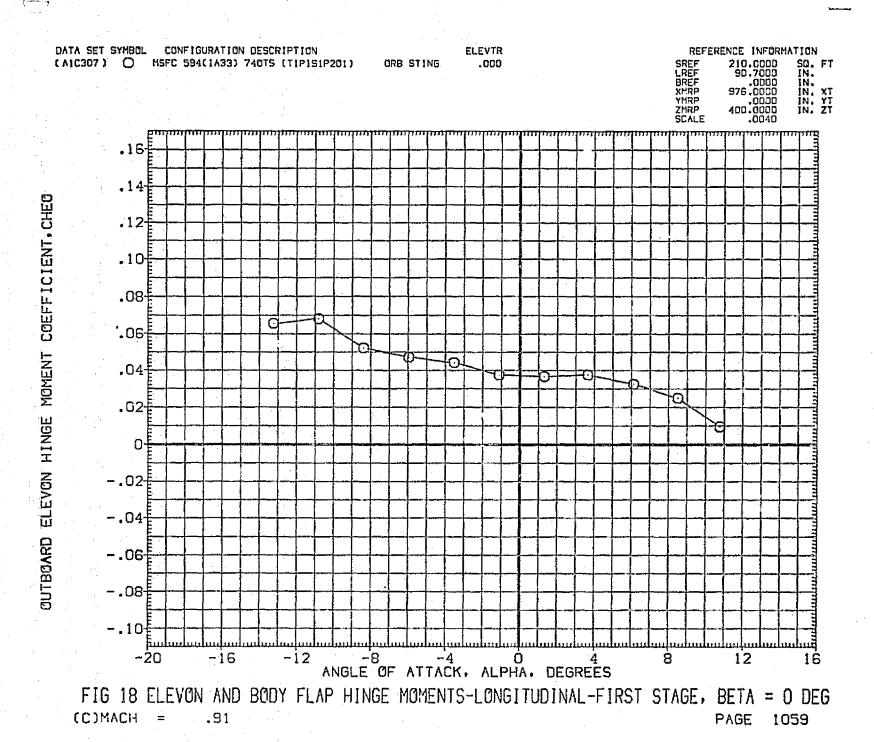
FIG 17 LATERAL/DIRECTIONAL ELEVON EFFECTIVENESS-FIRST STAGE, ALPHA = 0 DEG

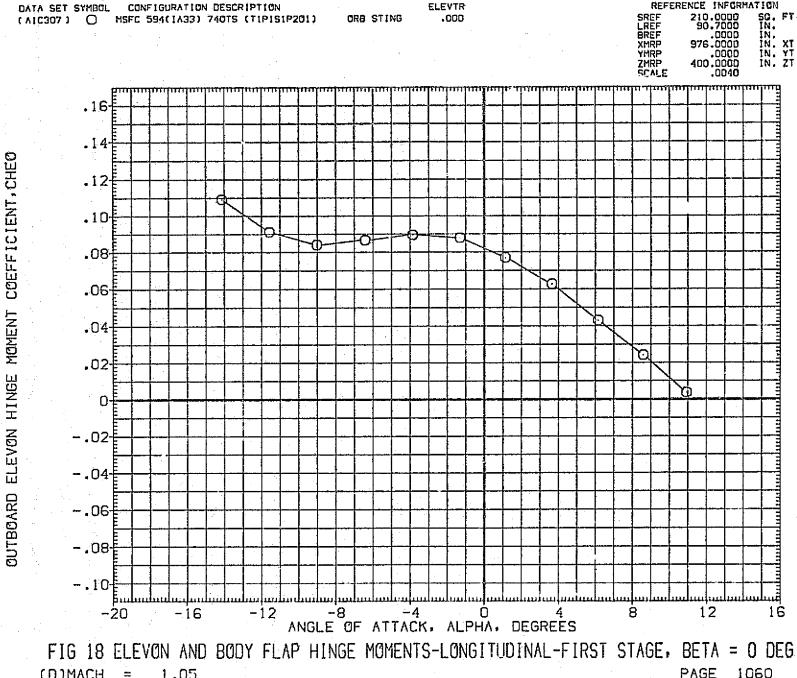
(K)BETA = 10.00

PAGE 1056



ELEVTR





PAGE 1060 CDOMACH

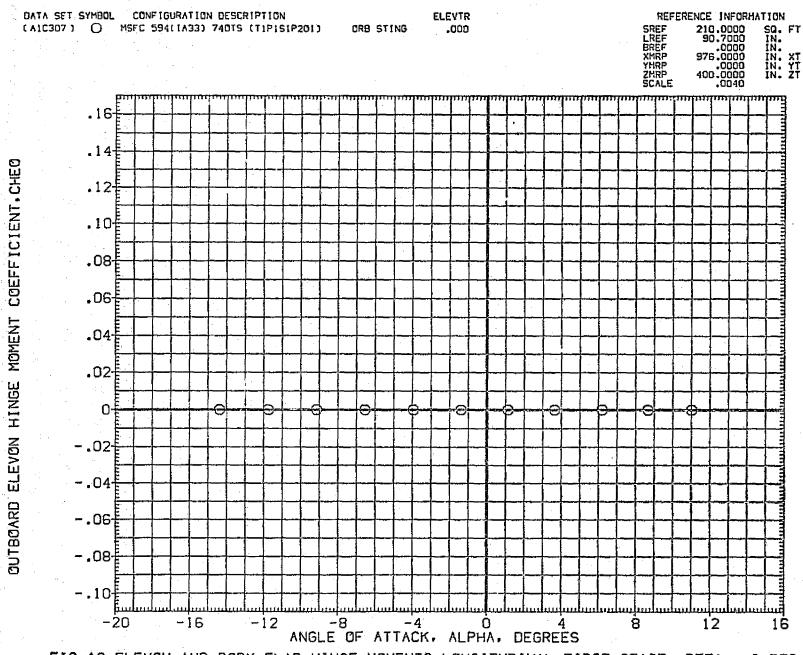


FIG 18 ELEVON AND BODY FLAP HINGE MOMENTS-LONGITUDINAL-FIRST STAGE, BETA = 0 DEG
(E)MACH = 1.10

PAGE 1061

DATA SET SYMBOL CONFIGURATION DESCRIPTION

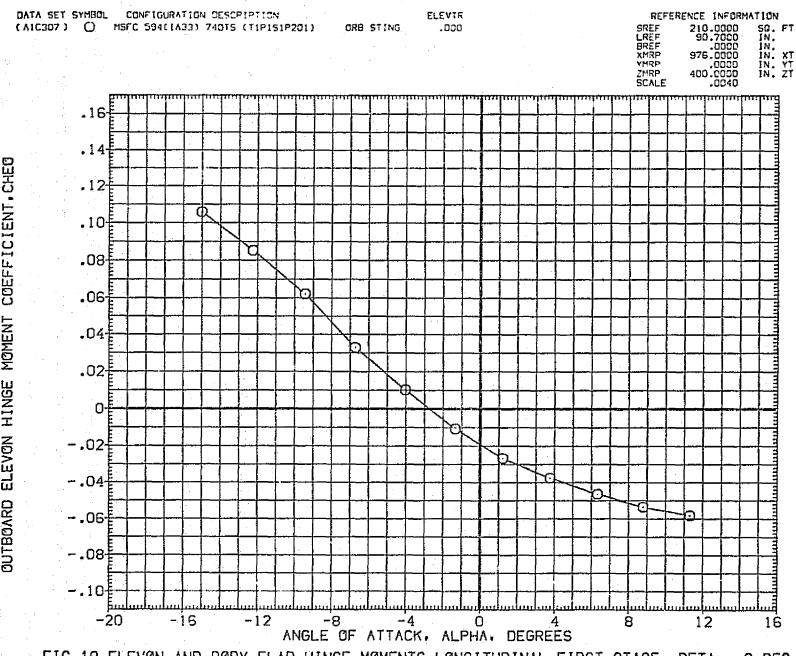
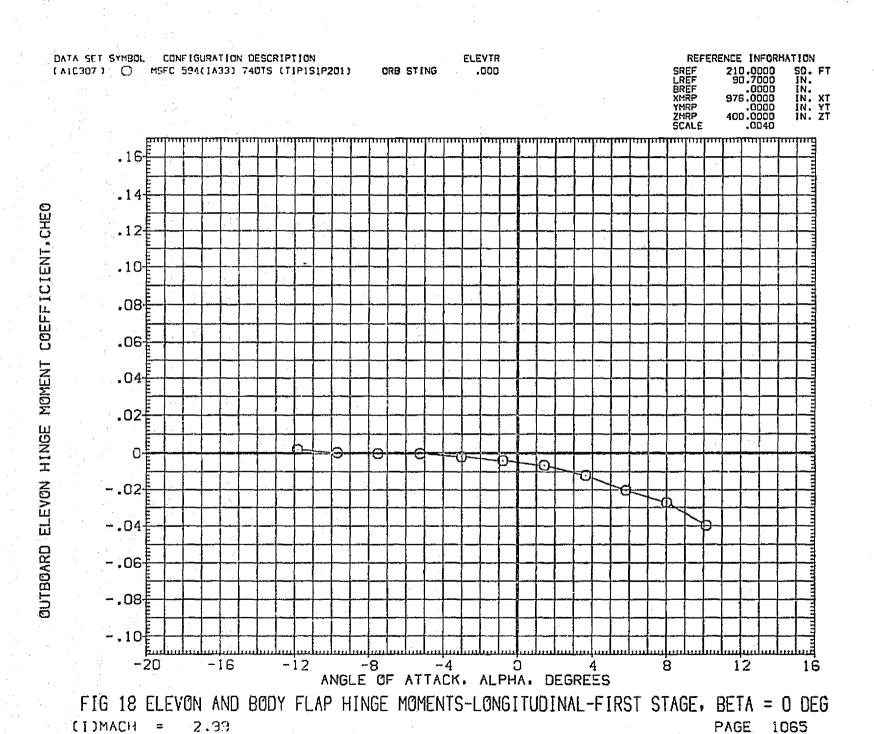
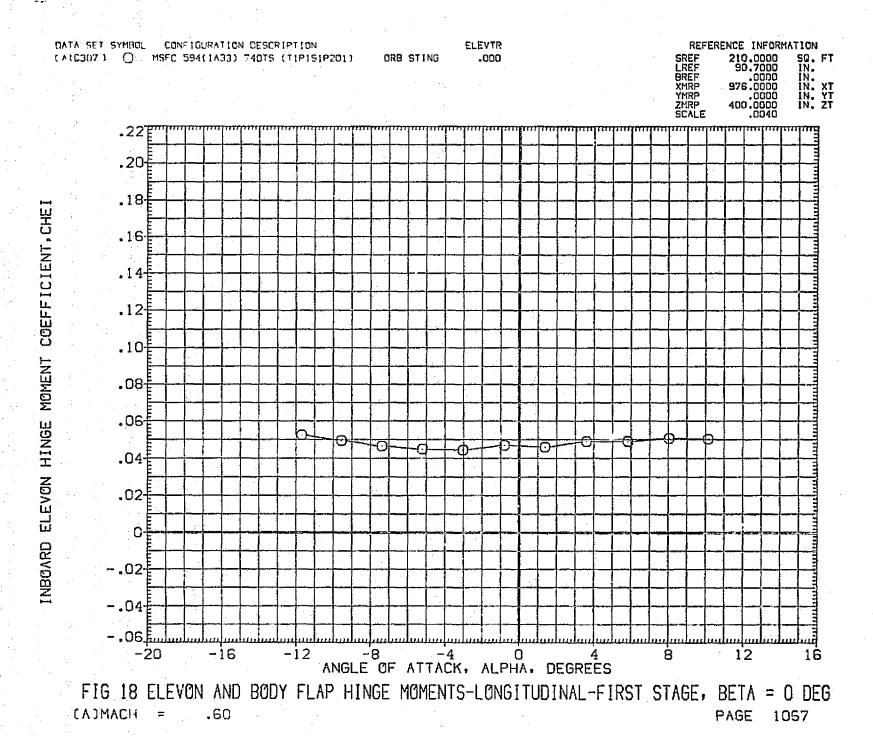


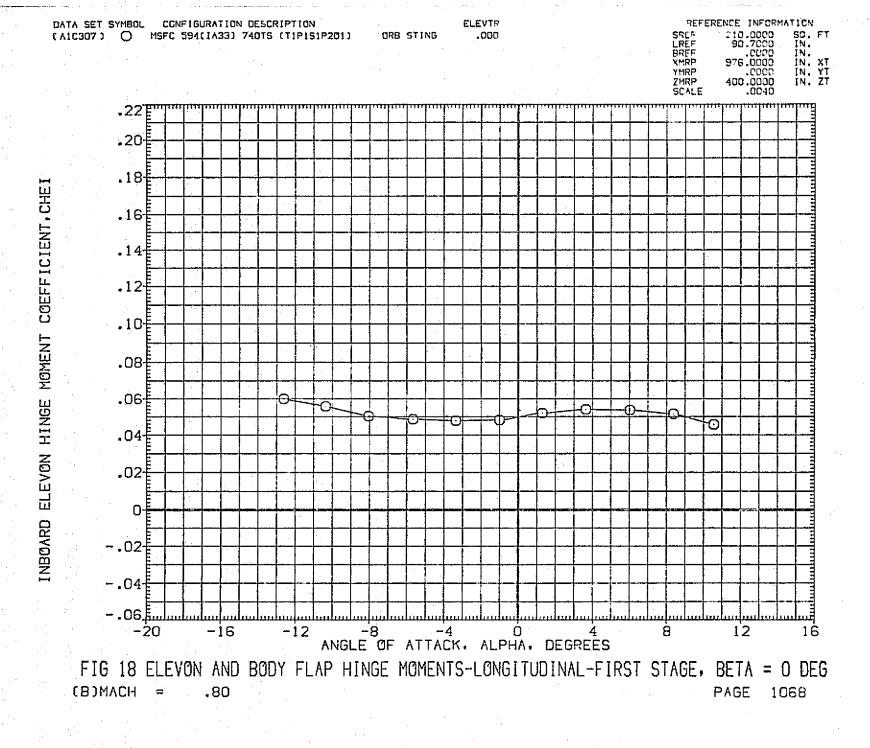
FIG 18 ELEVON AND BODY FLAP HINGE MOMENTS-LONGITUDINAL-FIRST STAGE, BETA = 0 DEG
(G)MACH = 1.46

PAGE 1063

CHOMACH = PAGE 1064







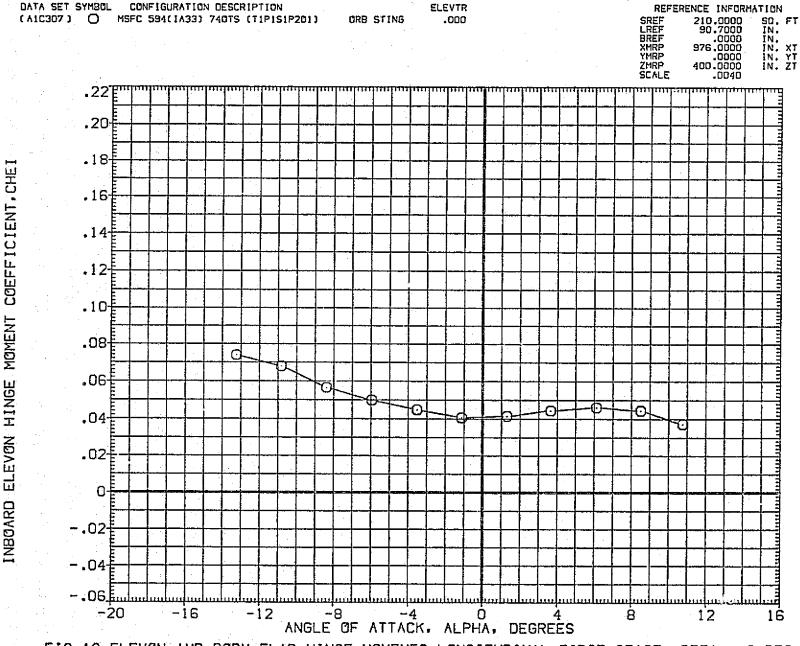
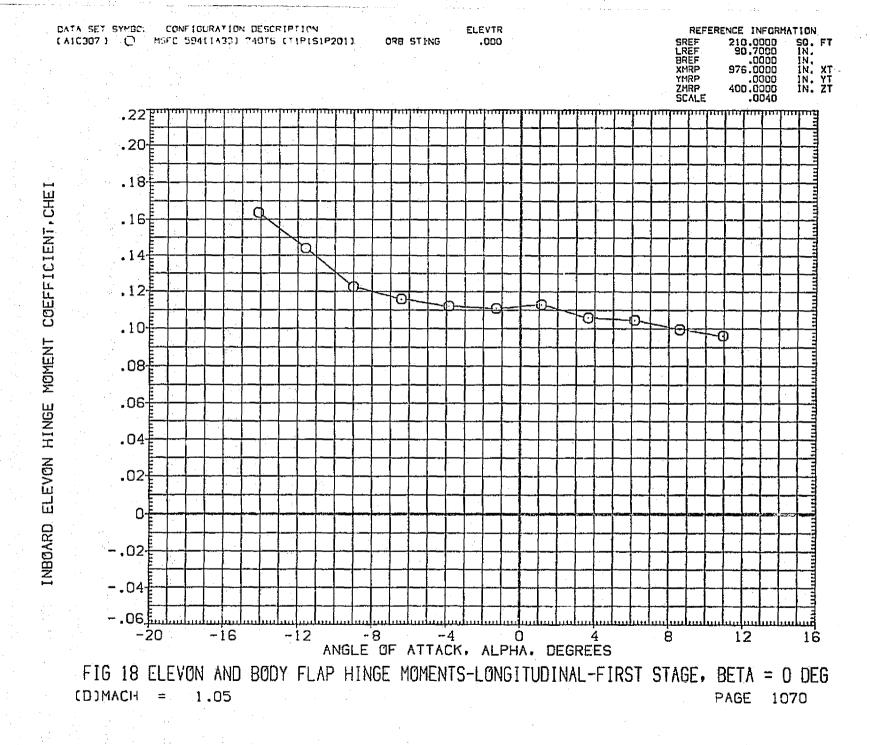


FIG 18 ELEVON AND BODY FLAP HINGE MOMENTS-LONGITUDINAL-FIRST STAGE, BETA = 0 DEG (C)MACH = .91



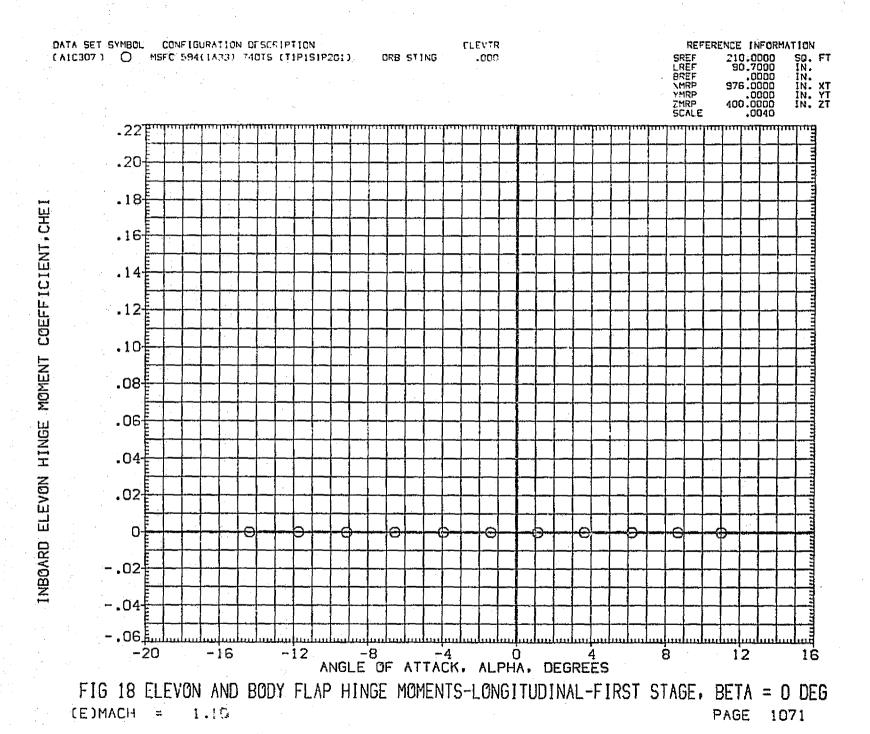


FIG 18 ELEVON AND BODY FLAP HINGE MOMENTS-LONGITUDINAL-FIRST STAGE, BETA = 0 DEG

(F)MACH = 1.25

PAGE 1072

-8 -4 0 4 ANGLE OF ATTACK, ALPHA, DEGREES 12

INBOARD

-.02

-.04

سلة 20.-

-16

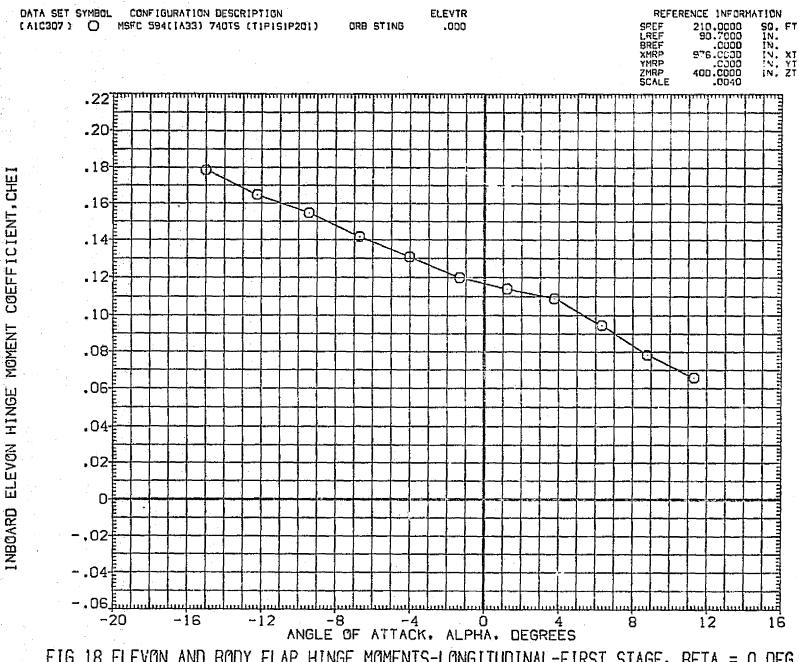
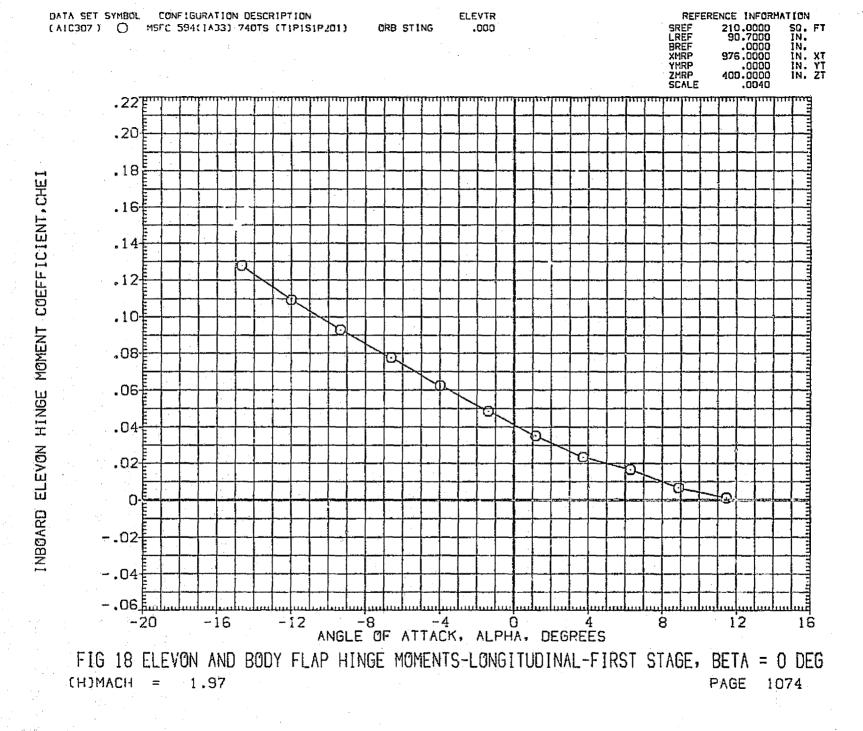


FIG 18 ELEVON AND BODY FLAP HINGE MOMENTS-LONGITUDINAL-FIRST STAGE, BETA = 0 DEG

(G)MACH = 1.46

PAGE 1073



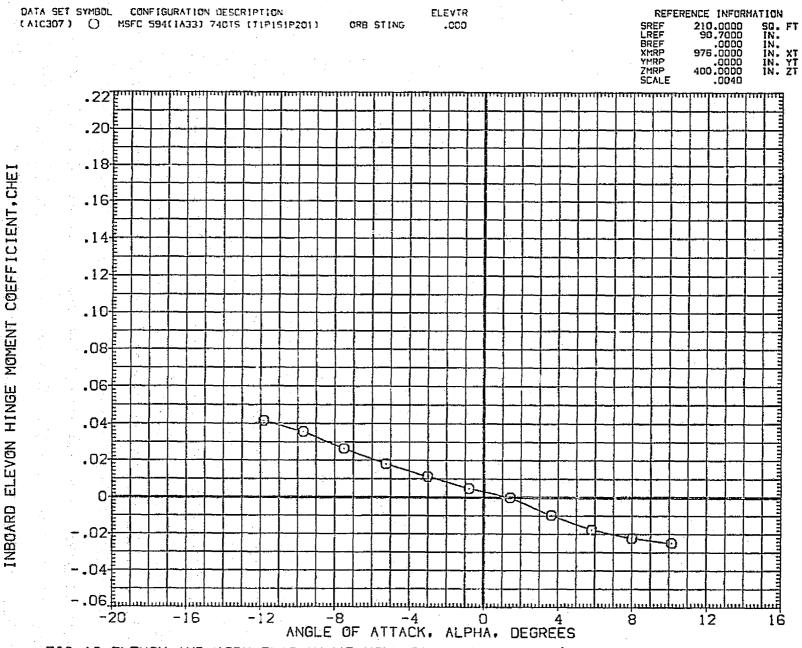
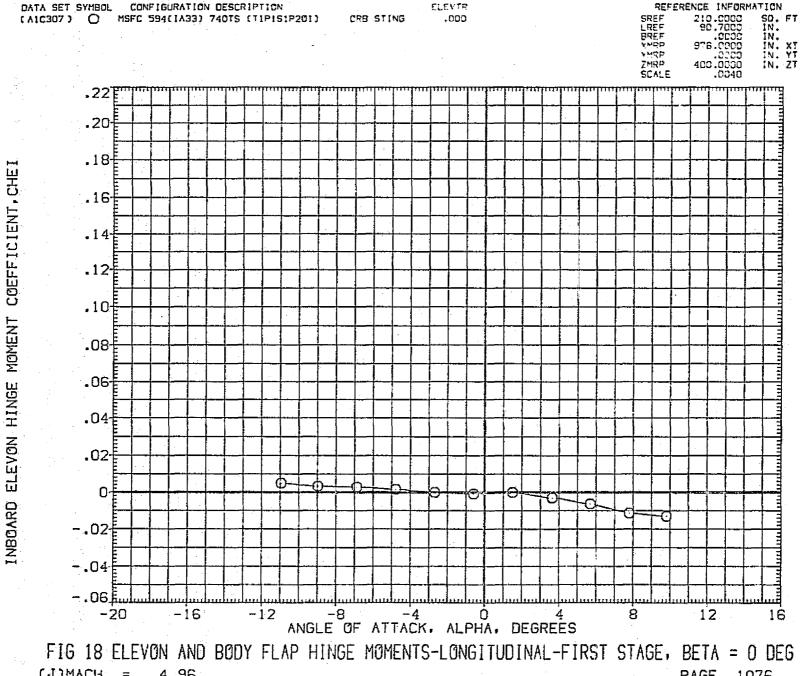


FIG 18 ELEVON AND BODY FLAP HINGE MOMENTS-LONGITUDINAL-FIRST STAGE, BETA = 0 DEG



CJ3MACH = PAGE 1076

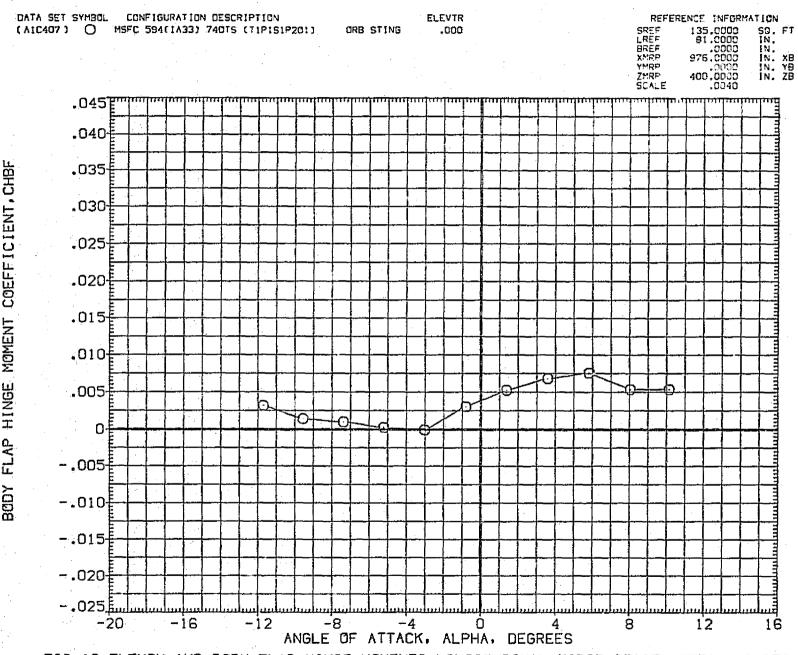
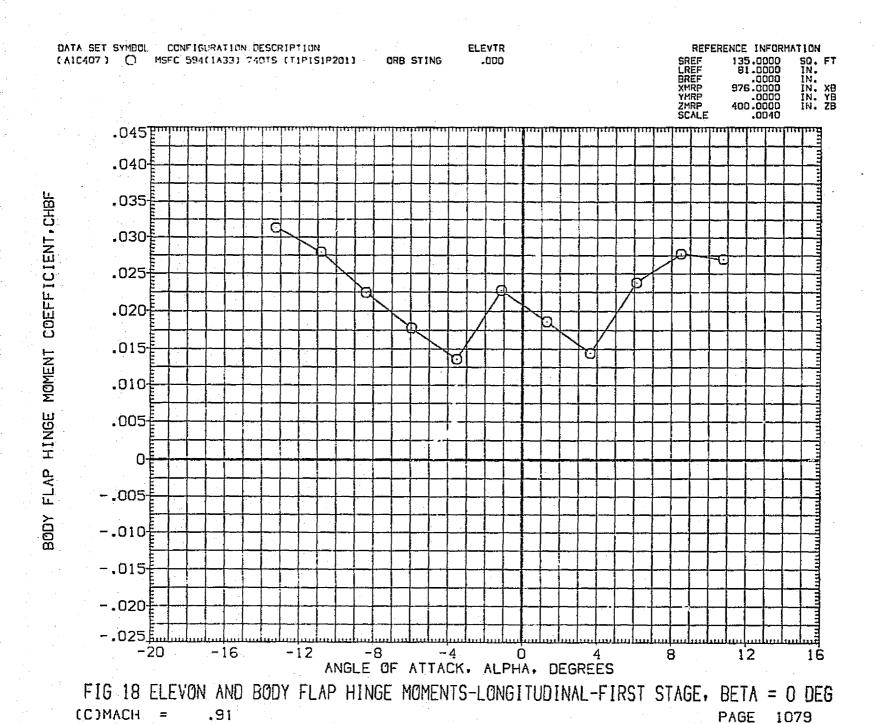


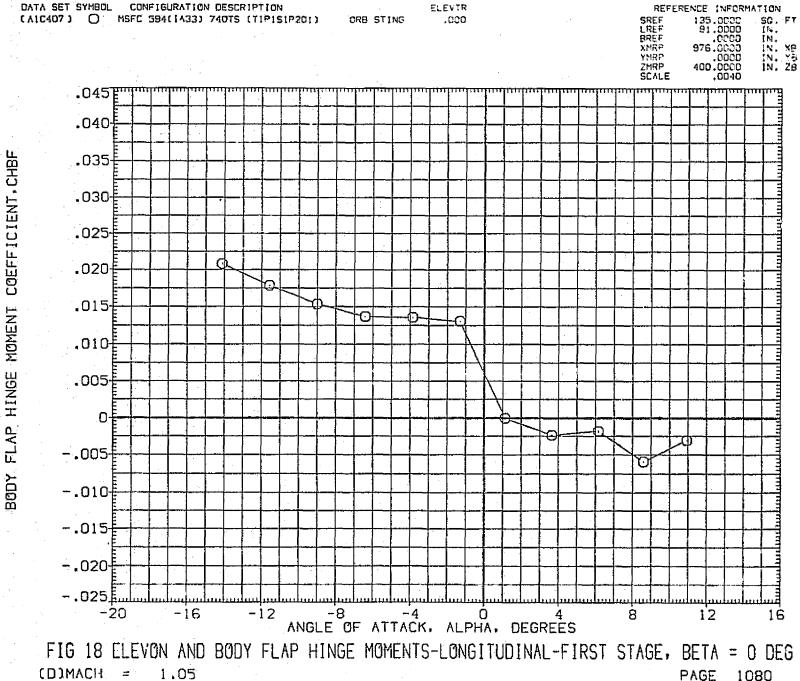
FIG 18 ELEVON AND BODY FLAP HINGE MOMENTS-LONGITUDINAL-FIRST STAGE, BETA = 0 DEG
(A)MACH = .60
PAGE 1077

ELEVIR

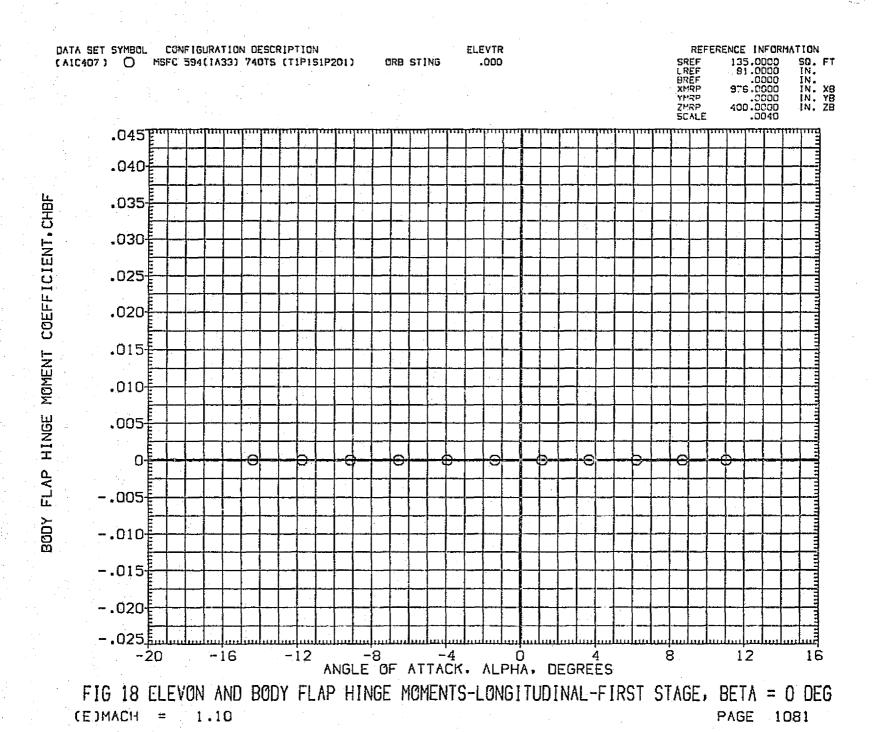
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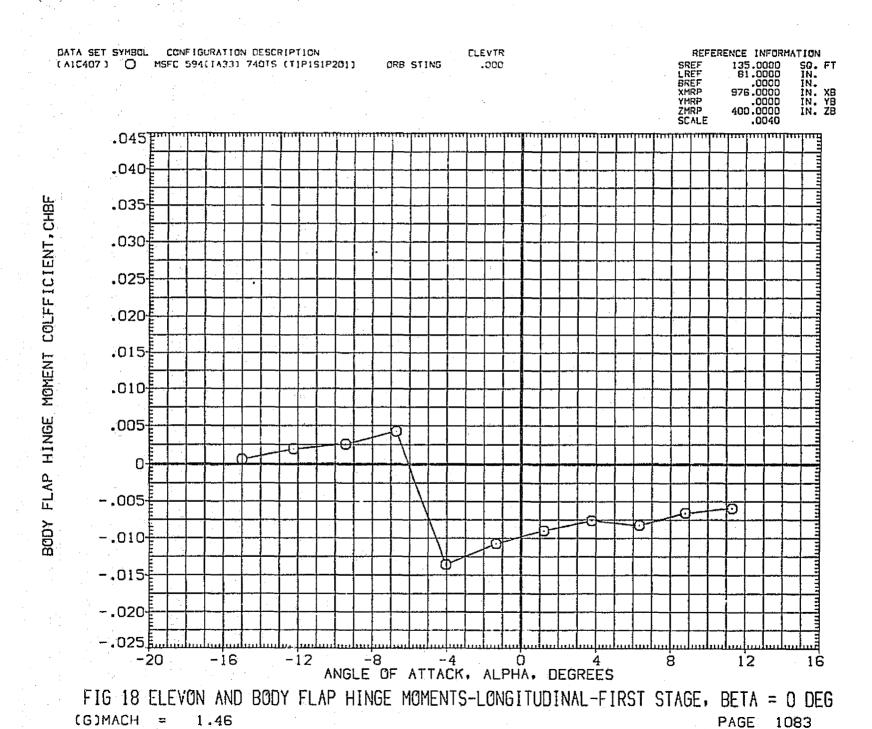
DATA SET SYMBOL CONFIGURATION DESCRIPTION





PAGE 1080





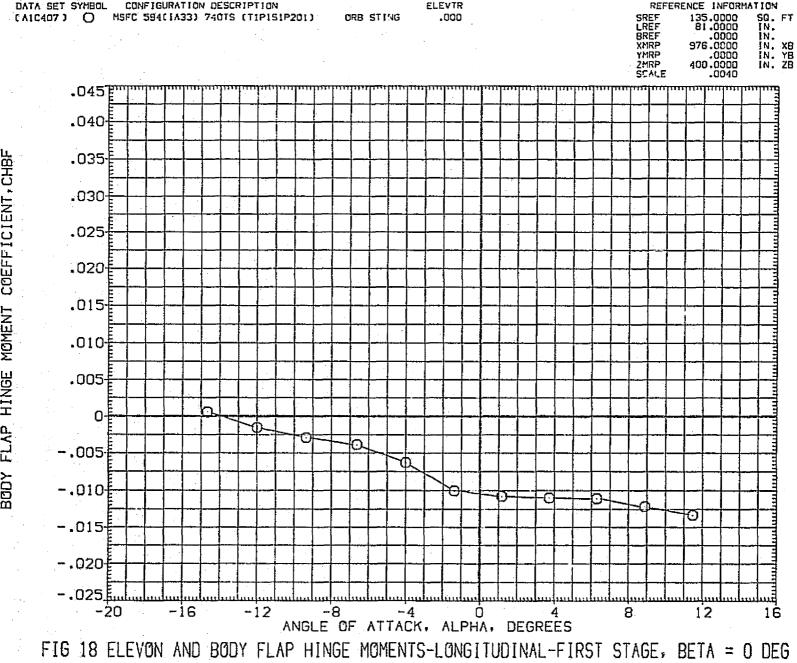


FIG 18 ELEVON AND BODY FLAP HINGE MOMENTS-LONGITUDINAL-FIRST STAGE, BETA = 0 DEG

CHOMACH = 1.97

PAGE 1084

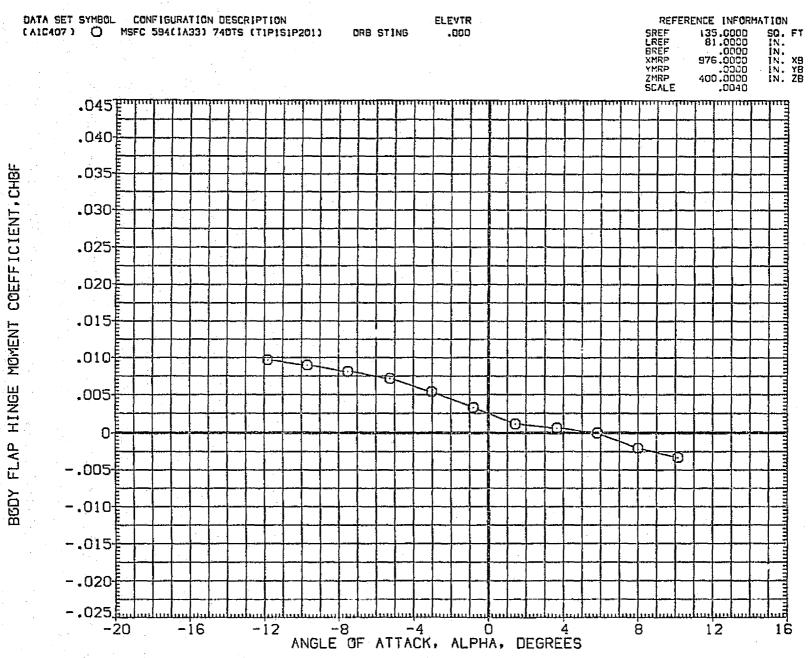
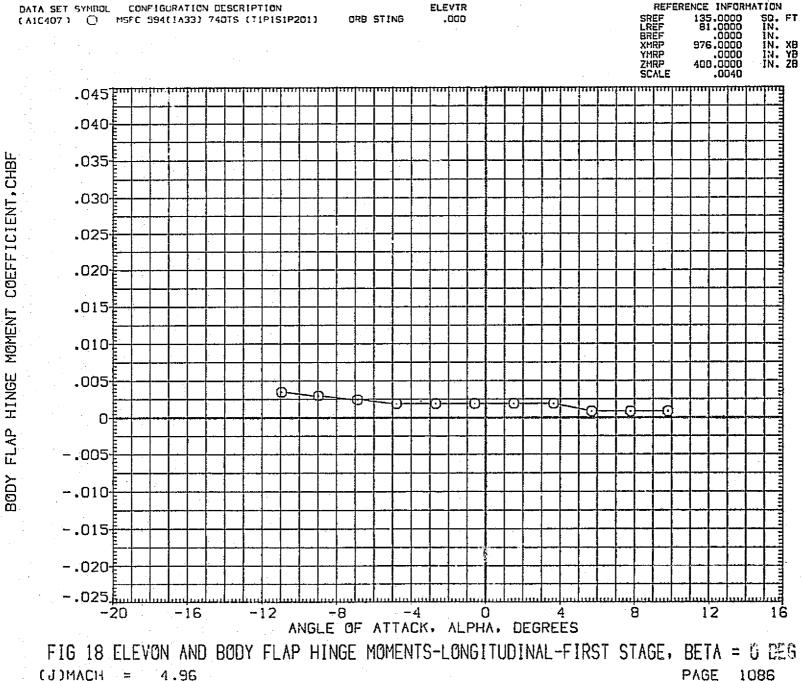


FIG 18 ELEVON AND BODY FLAP HINGE MOMENTS-LONGITUDINAL-FIRST STAGE, BETA = 0 DEG



PAGE 1086 (J)MACH = 4.96

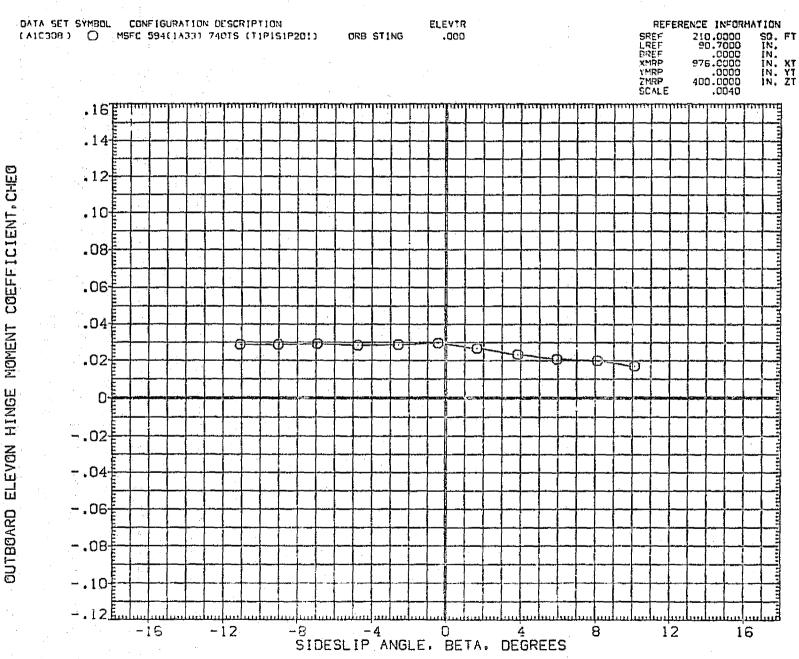
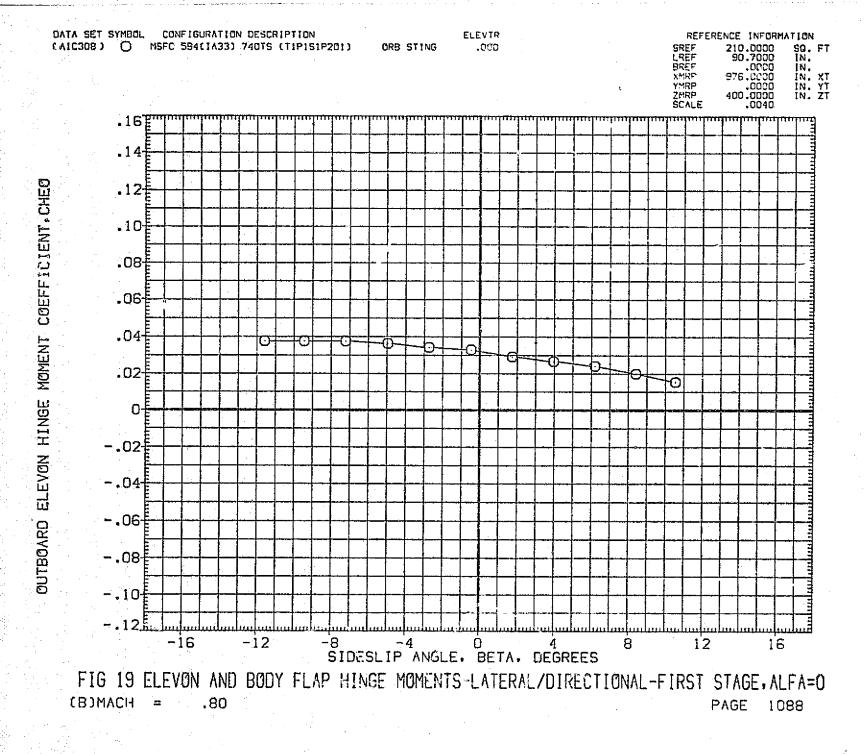


FIG 19 ELEVON AND BODY FLAP HINGE MOMENTS-LATERAL/DIRECTIONAL-FIRST STAGE, ALFA=0

(A)MACH PAGE 1087



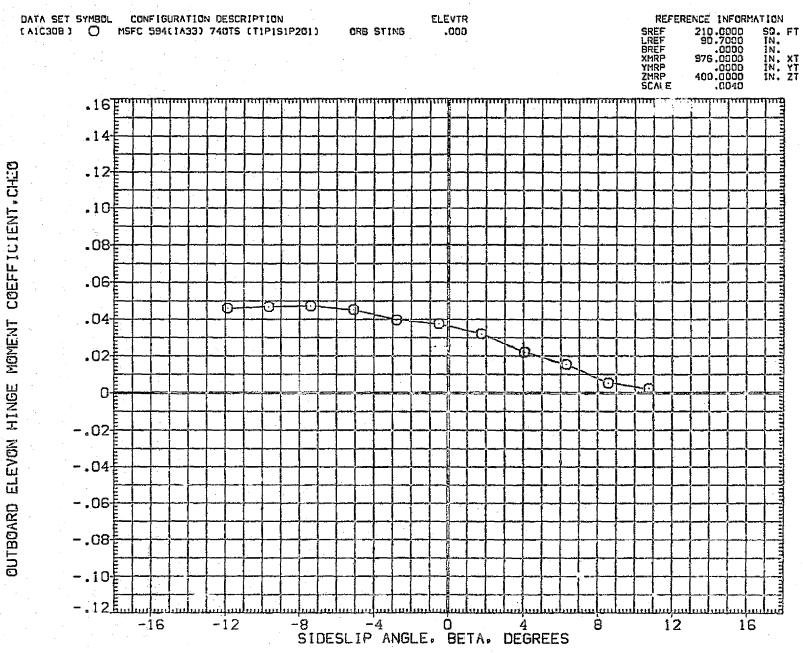
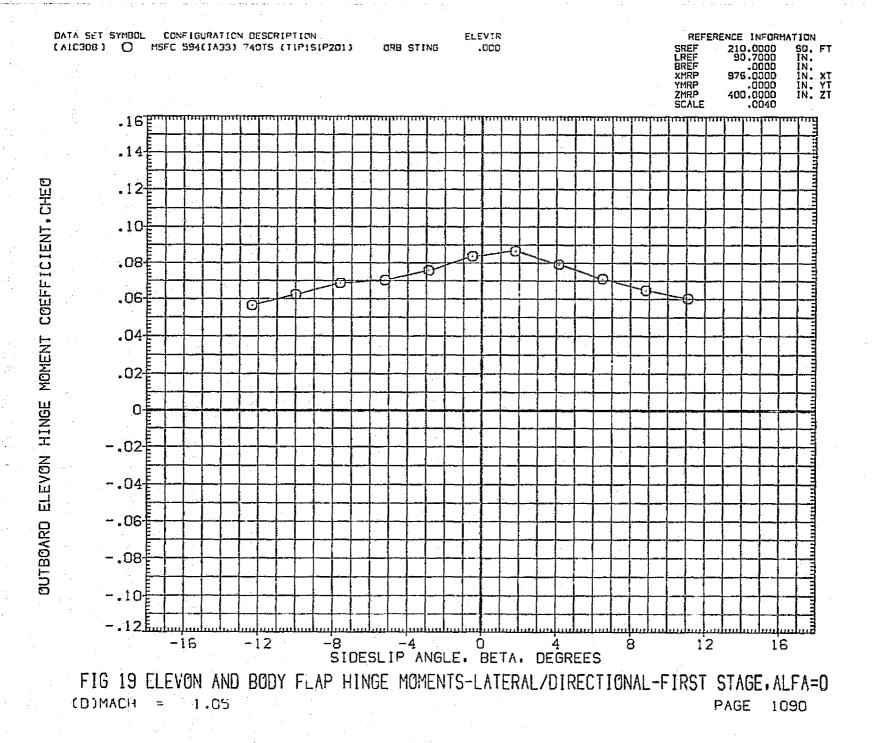


FIG 19 ELEVON AND BODY FLAP HINGE MOMENTS-LATERAL/DIRECTIONAL-FIRST STAGE, ALFA=0

(C)MACH = .90

PAGE 1089



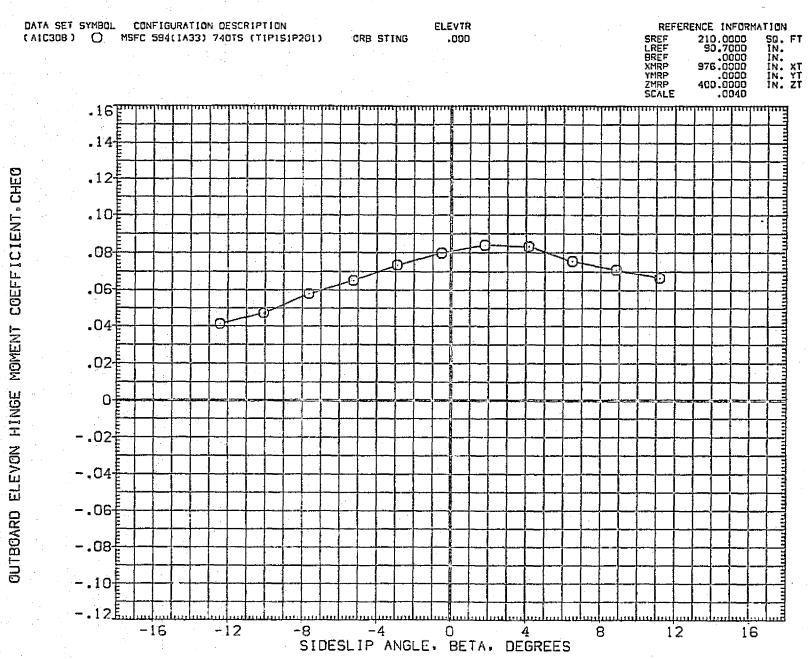
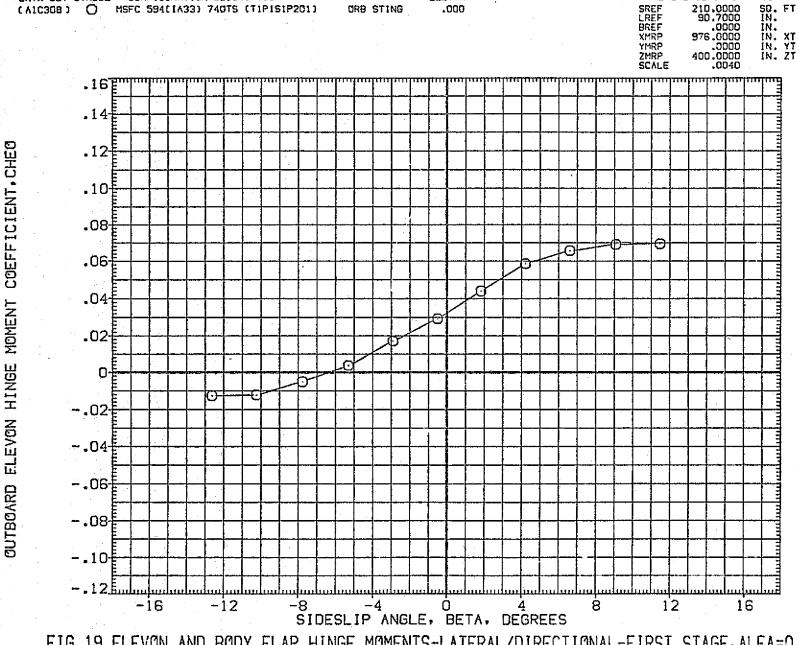


FIG 19 ELEVON AND BODY FLAP HINGE MOMENTS-LATERAL/DIRECTIONAL-FIRST STAGE, ALFA=0
(E)MACH = 1.10

PAGE 1091



DATA SET SYMBOL CONFIGURATION DESCRIPTION

FIG 19 ELEVON AND BODY FLAP HINGE MOMENTS-LATERAL/DIRECTIONAL-FIRST STAGE, ALFA=0
(F)MACH = 1.25
PAGE 1092

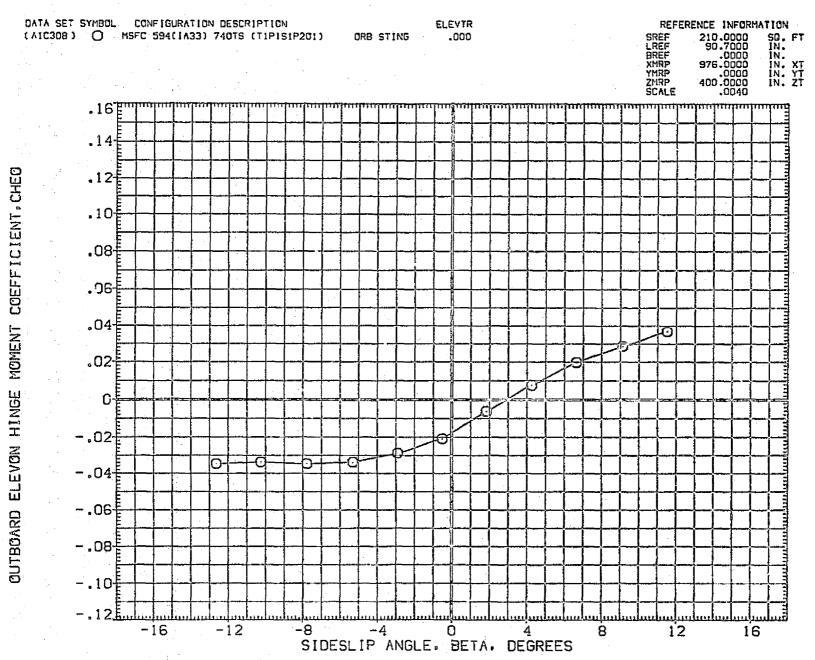
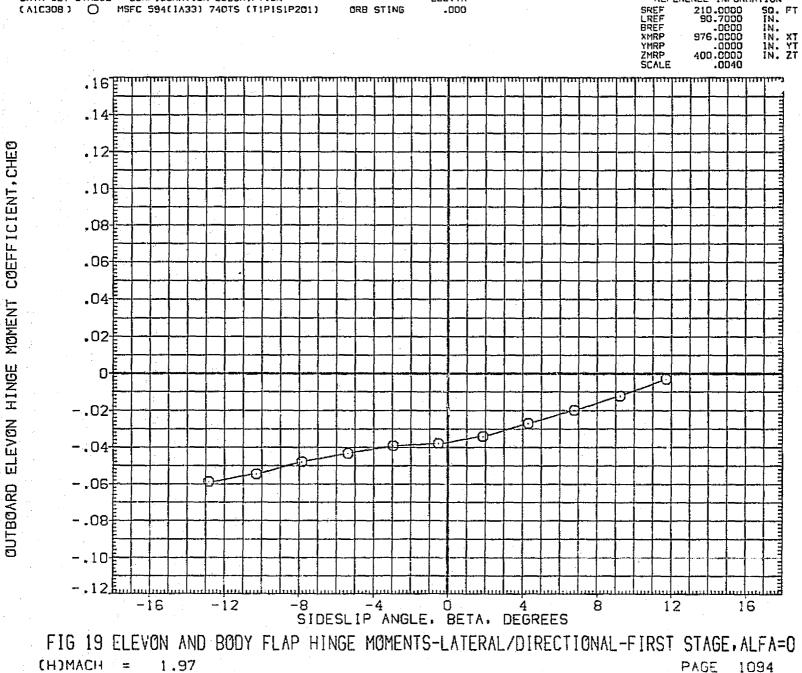


FIG 19 ELEVON AND BODY FLAP HINGE MOMENTS-LATERAL/DIRECTIONAL-FIRST STAGE, ALFA=0

(G)MACH = 1.47

PAGE 1093



REFERENCE INFORMATION

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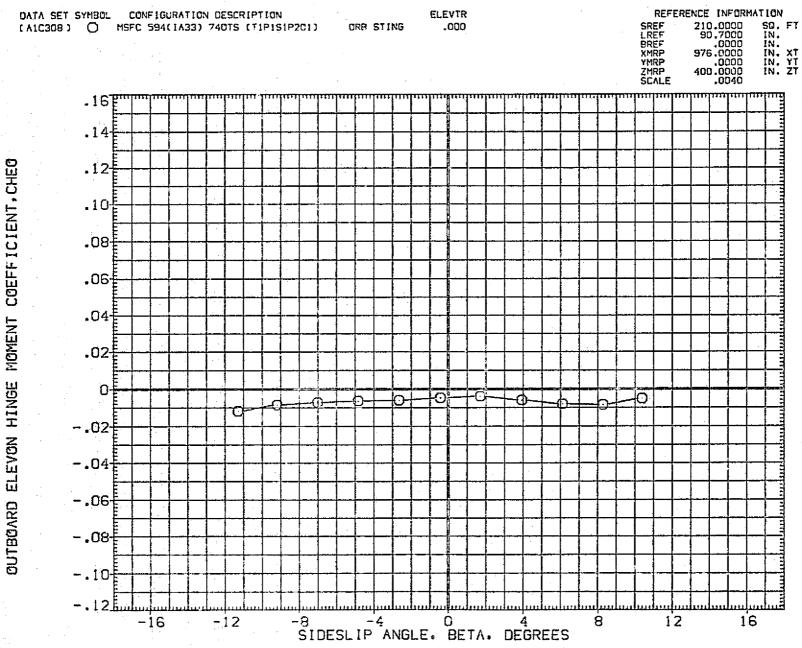
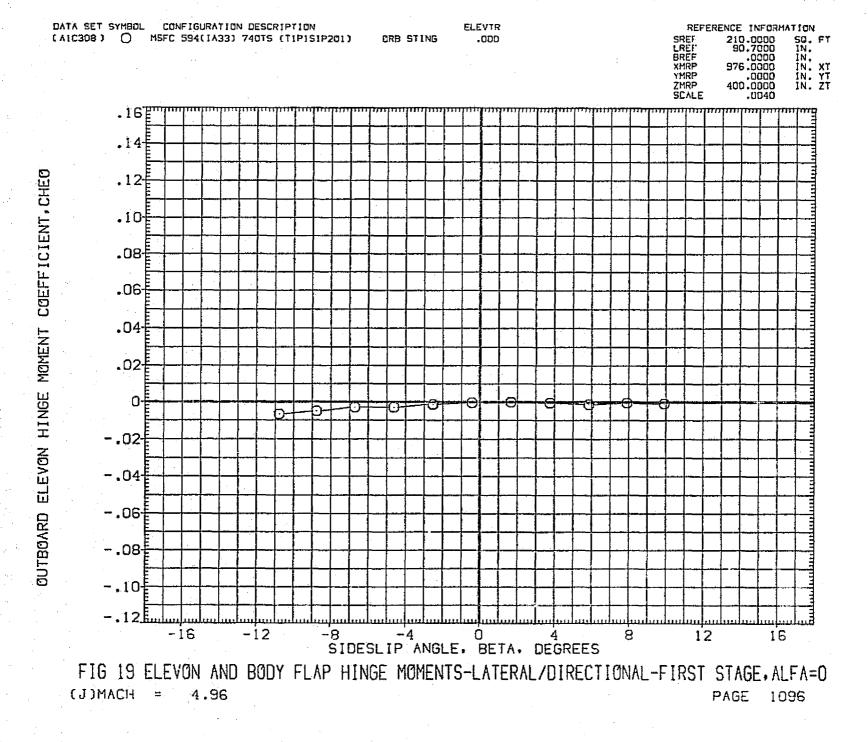


FIG 19 ELEVON AND BODY FLAP HINGE MOMENTS-LATERAL/DIRECTIONAL-FIRST STAGE, ALFA=0
(1)MACH = 2.99
PAGE 1095



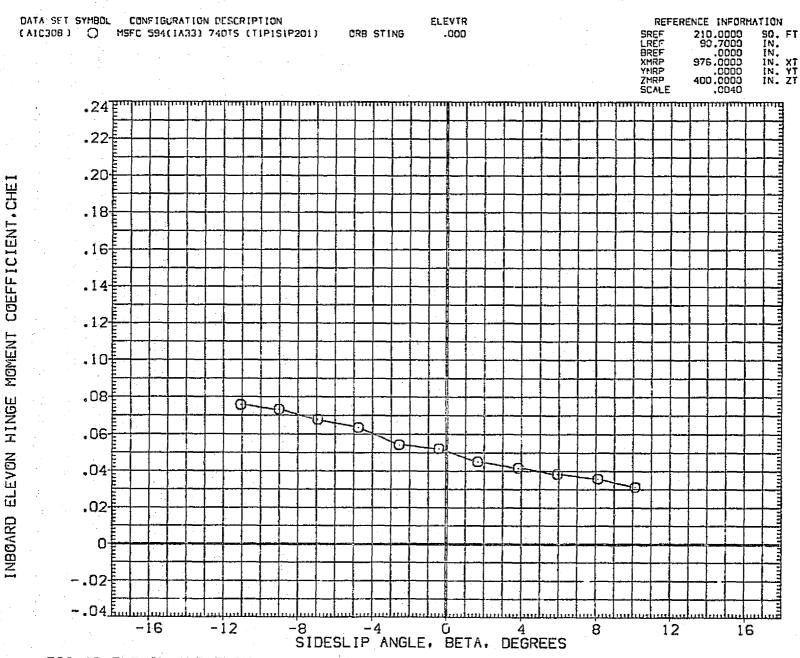


FIG 19 ELEVON AND BODY FLAP HINGE MOMENTS-LATERAL/DIRECTIONAL-FIRST STAGE, ALFA=0
(A)MACH = .60
PAGE 1097

FIG 19 ELEVON AND BODY FLAP HINGE MOMENTS-LATERAL/DIRECTIONAL-FIRST STAGE, ALFA=C

(B)MACH = .80

PAGE 1098

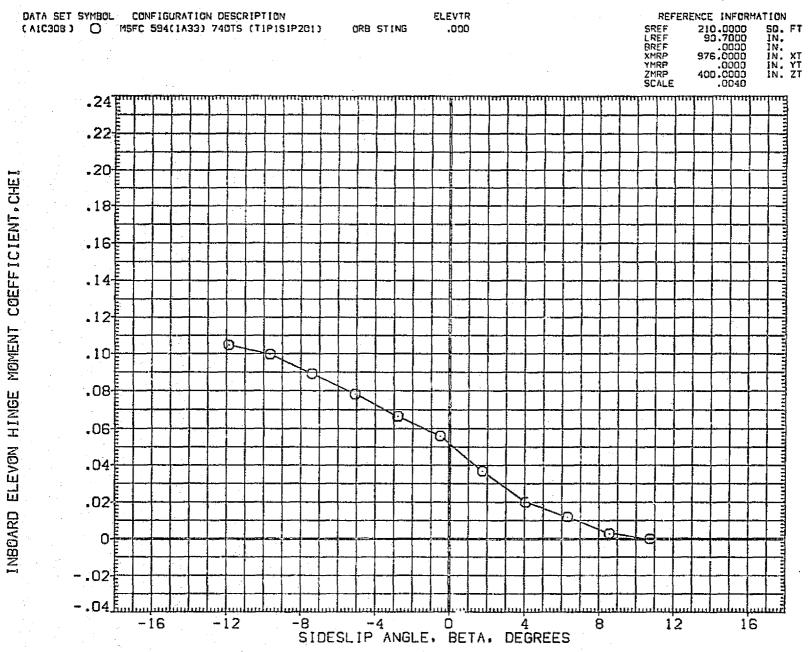
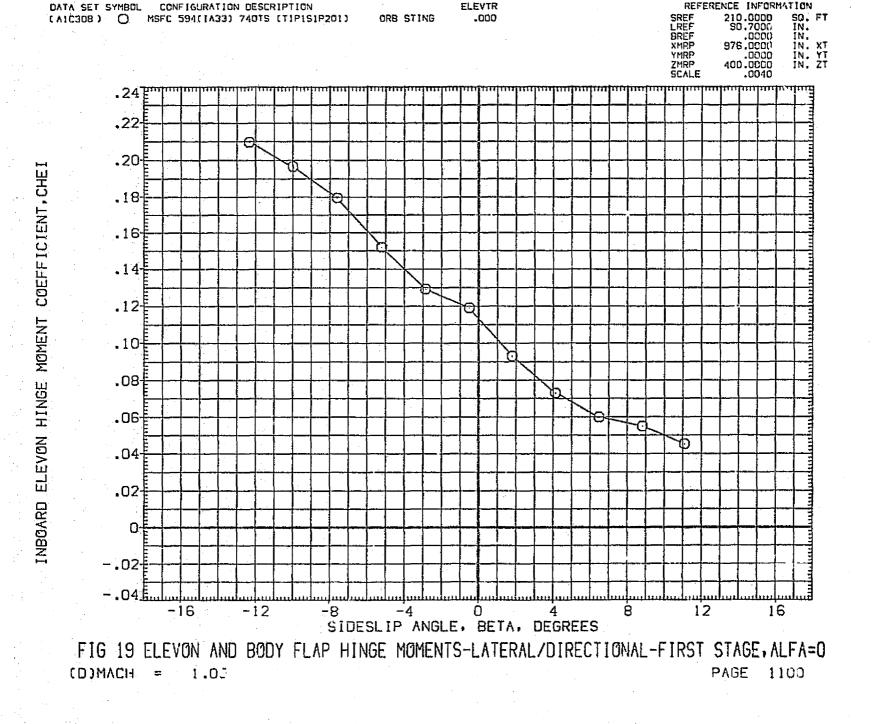


FIG 19 ELEVON AND BODY FLAP HINGE MOMENTS-LATERAL/DIRECTIONAL-FIRST STAGE, ALFA=0

COMACH = .90

PAGE 1099



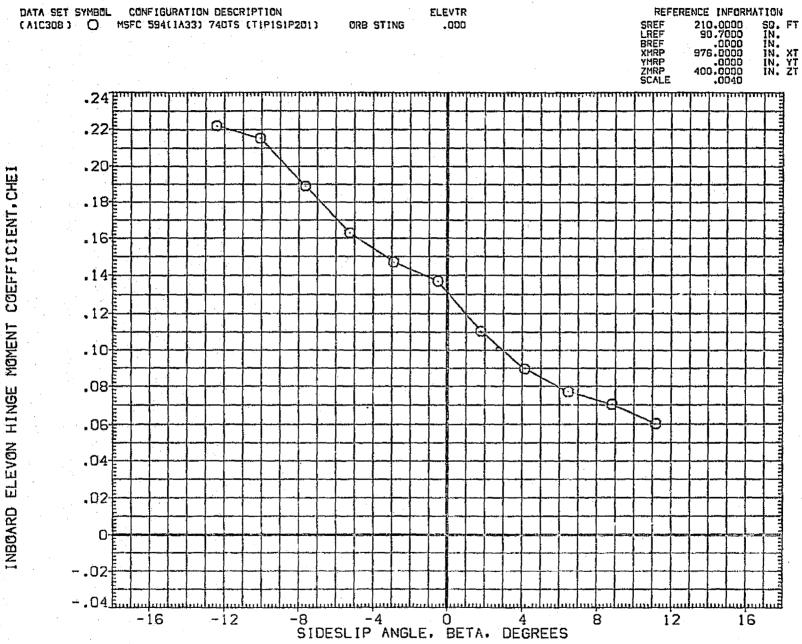
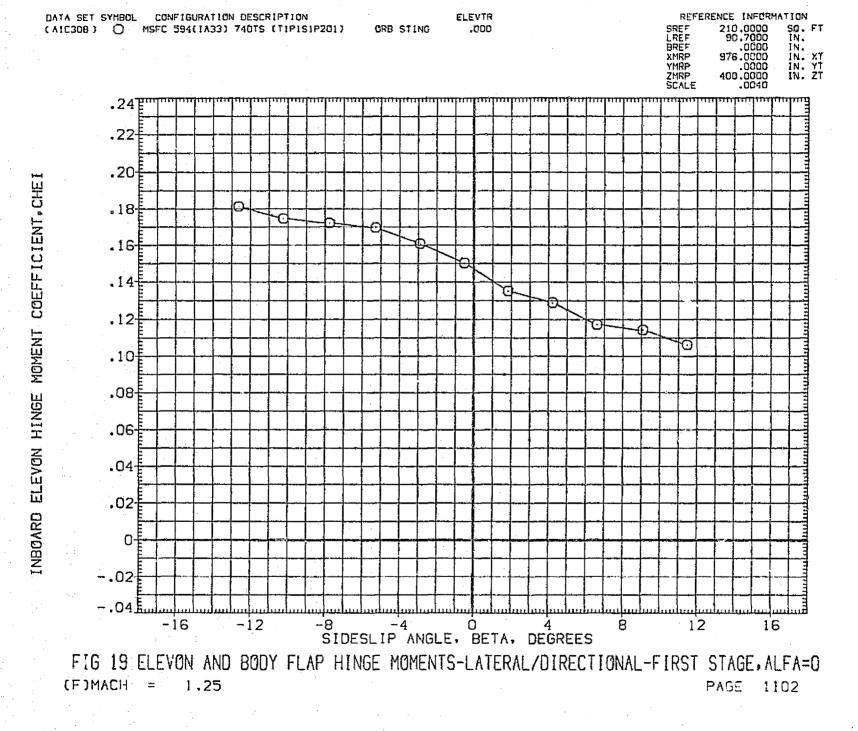


FIG 19 ELEVON AND BODY FLAP HINGE MOMENTS-LATERAL/DIRECTIONAL-FIRST STAGE.ALFA=0



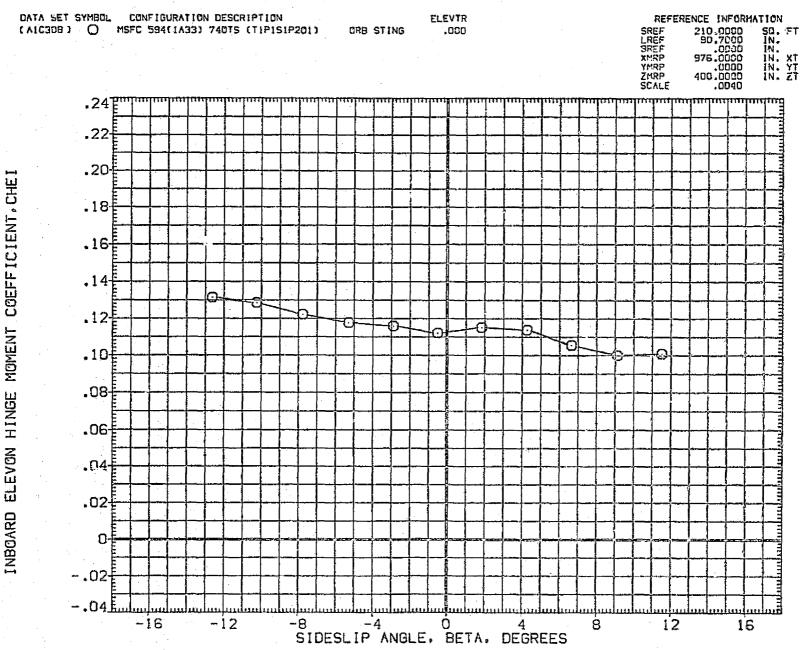
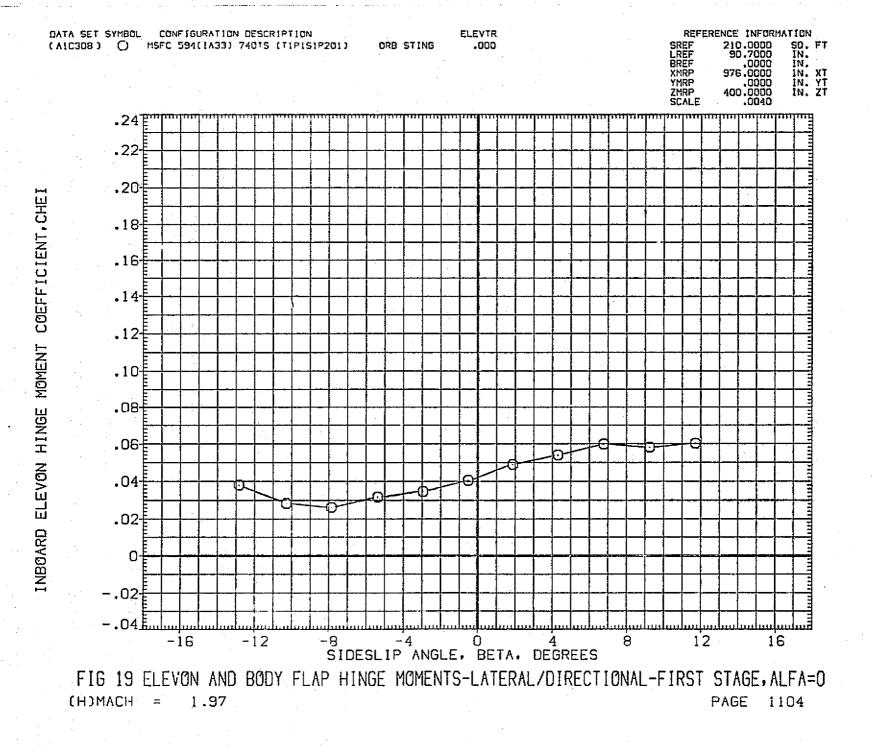


FIG 19 ELEVON AND BODY FLAP HINGE MOMENTS-LATERAL/DIRECTIONAL-FIRST STAGE, ALFA=0
(G)MACH = 1.47

PAGE 1103



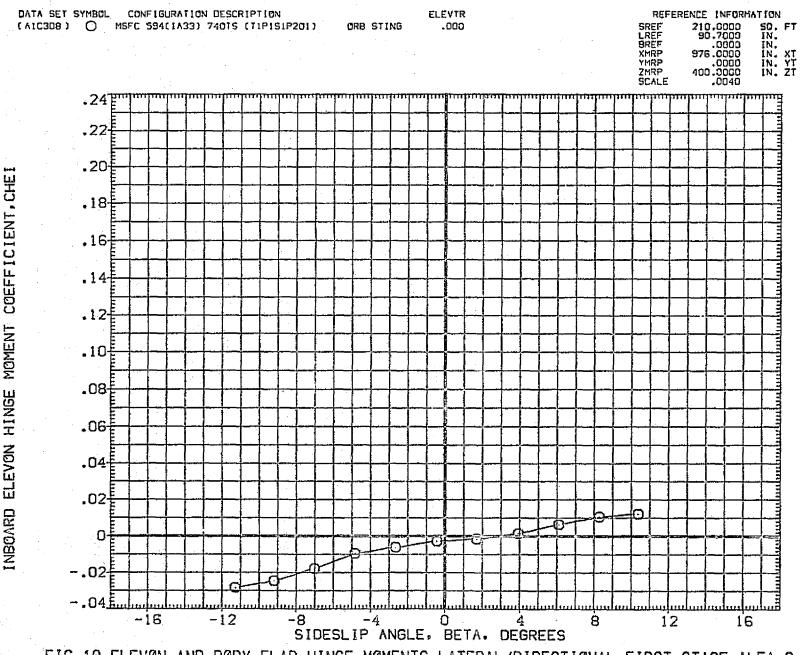


FIG 19 ELEVON AND BODY FLAP HINGE MOMENTS-LATERAL/DIRECTIONAL-FIRST STAGE, ALFA=0
PAGE 1105

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REFERENCE INFORMATION

12

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DATA SET SYMBOL CONFIGURATION DESCRIPTION

-16

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(A1C308) O MSFC 594(1A33) 740TS (T1P1S1P201)

FIG 19 ELEVON AND BODY FLAP HINGE MOMENTS-LATERAL/DIRECTIONAL-FIRST STAGE, ALFA=0 (J)MACH = 4.96PAGE 1106

-8 -4 0 4 SIDESLIP ANGLE, BETA, DEGREES

-4

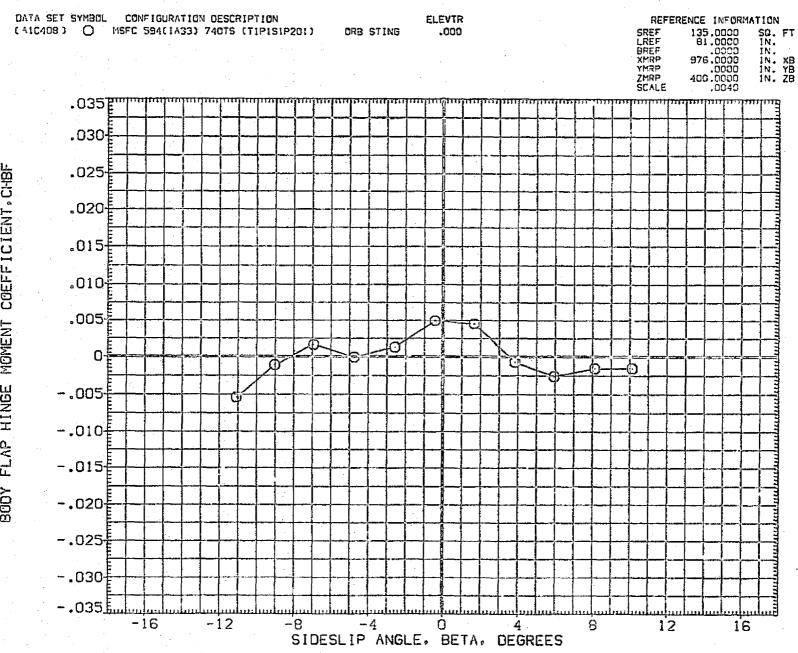
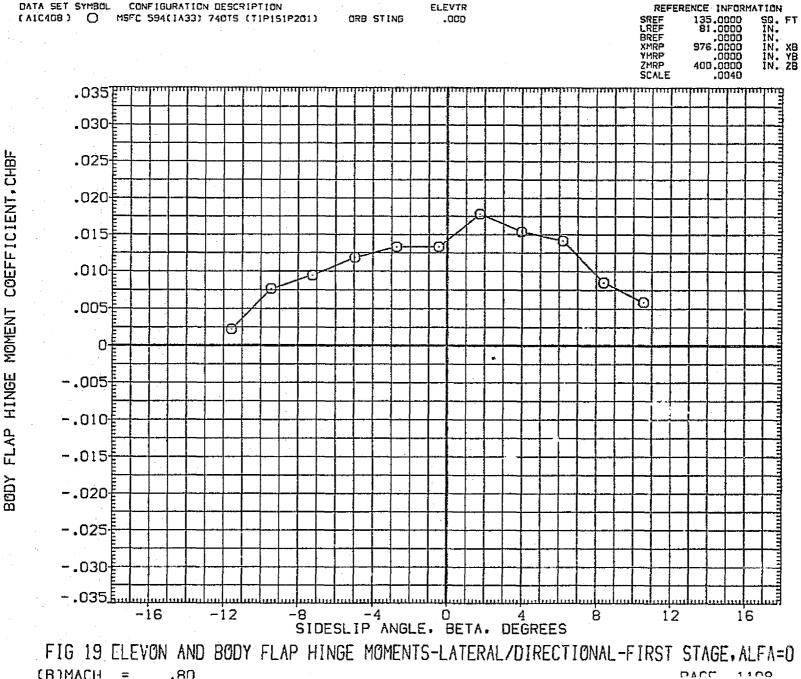


FIG 19 ELEVON AND BODY FLAP HINGE MOMENTS-LATERAL/DIRECTIONAL-FIRST STAGE, ALFA=0

[A]MACH = .60

PAGE 1107



(R)MACH = DACC 1100

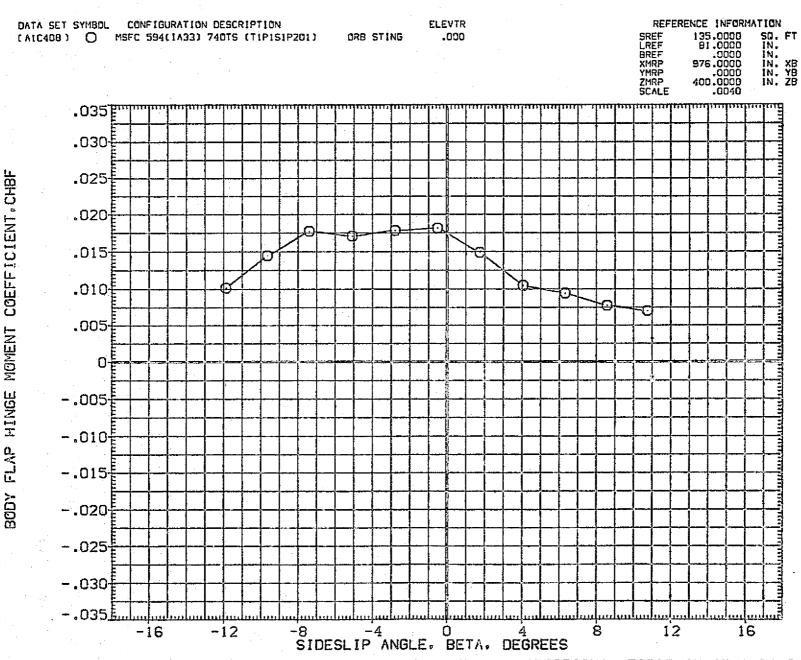
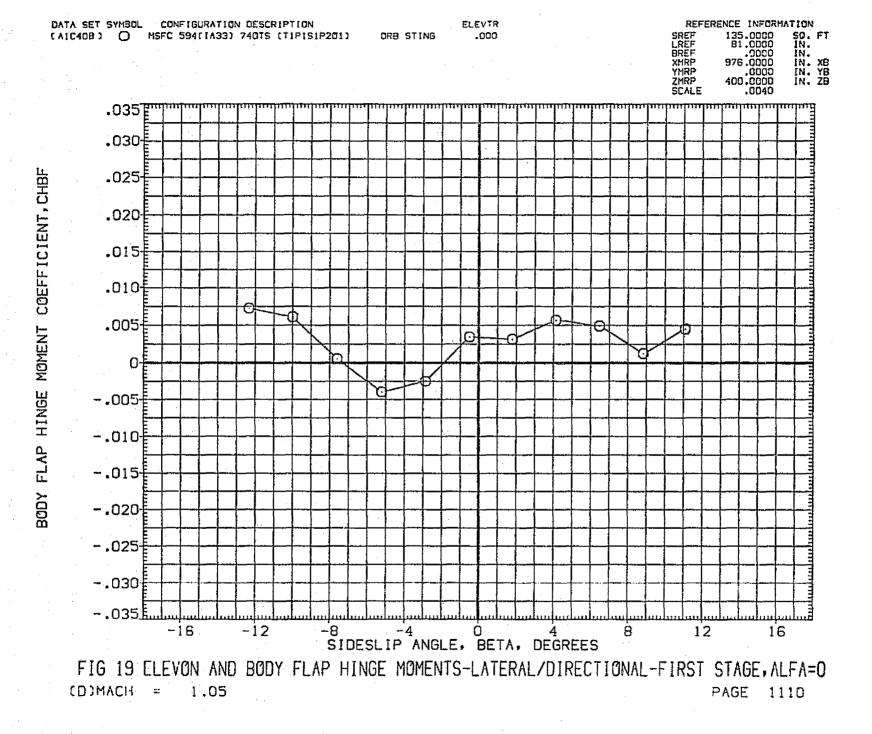
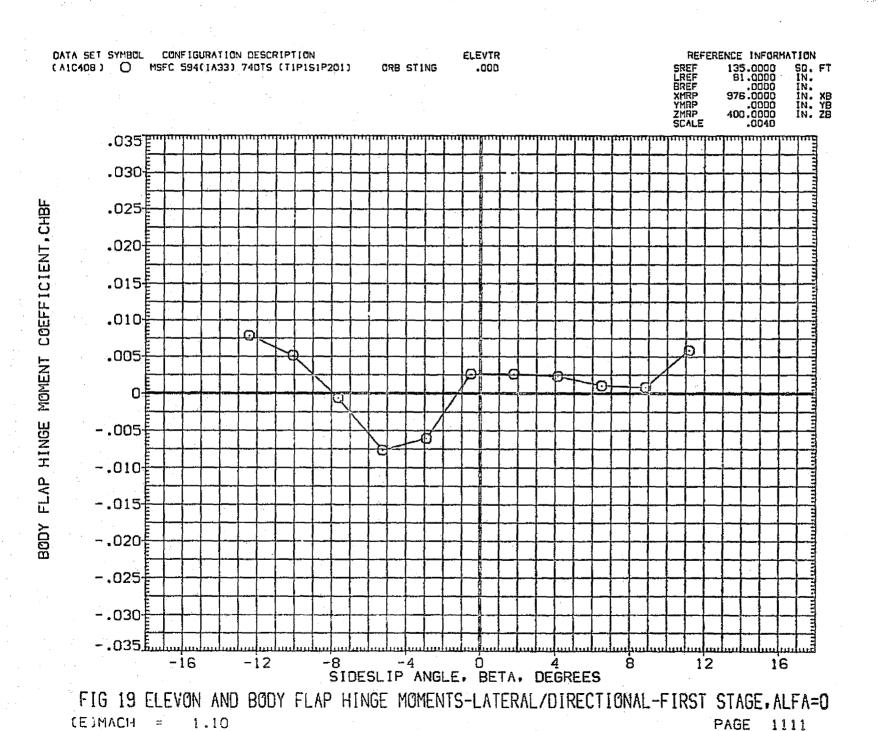


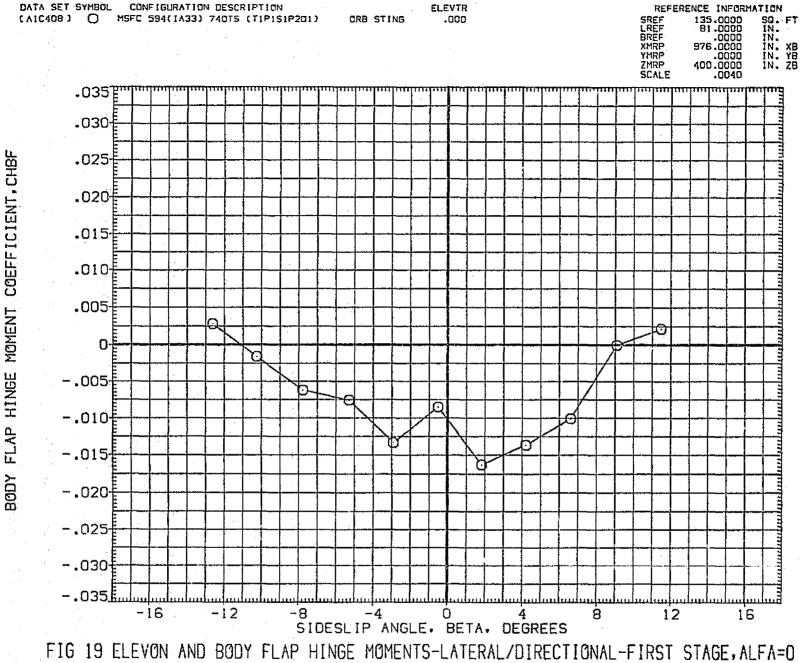
FIG 19 ELEVON AND BODY FLAP HINGE MOMENTS-LATERAL/DIRECTIONAL-FIRST STAGE, ALFA=0

(C)MACH = .90

PAGE 1109







CFJMACH = 1.25PAGE 1112

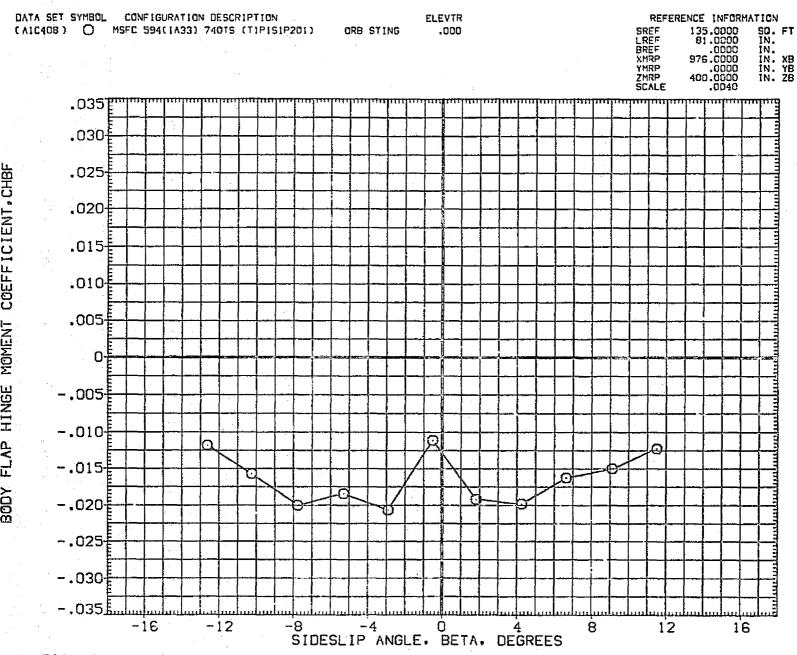


FIG 19 ELEVON AND BODY FLAP HINGE MOMENTS-LATERAL/DIRECTIONAL-FIRST STAGE, ALFA=0

(G)MACH = 1.47

PAGE 1113

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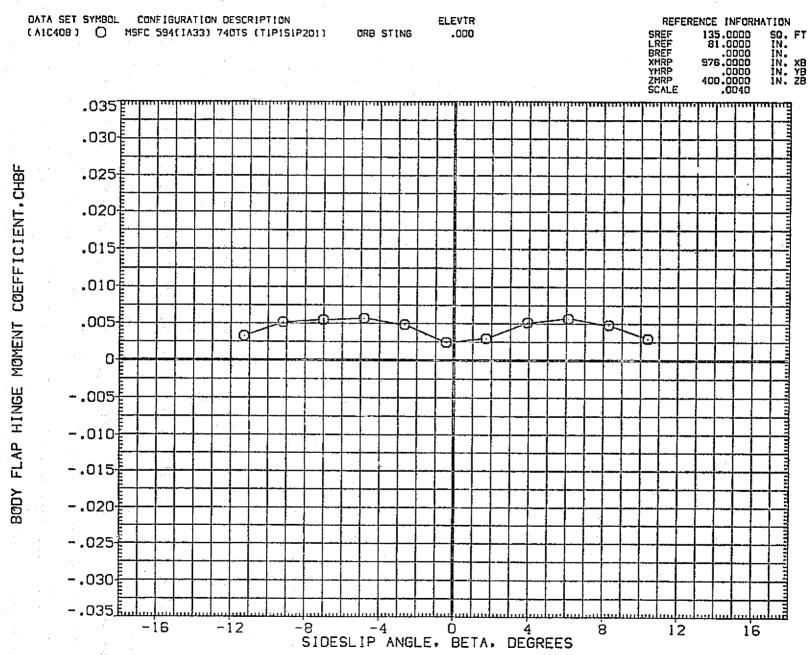


FIG 19 ELEVON AND BODY FLAP HINGE MOMENTS-LATERAL/DIRECTIONAL-FIRST STAGE, ALFA=0

[I]MACH = 2.99

PAGE 1115

ELEVTR

REFERENCE INFORMATION

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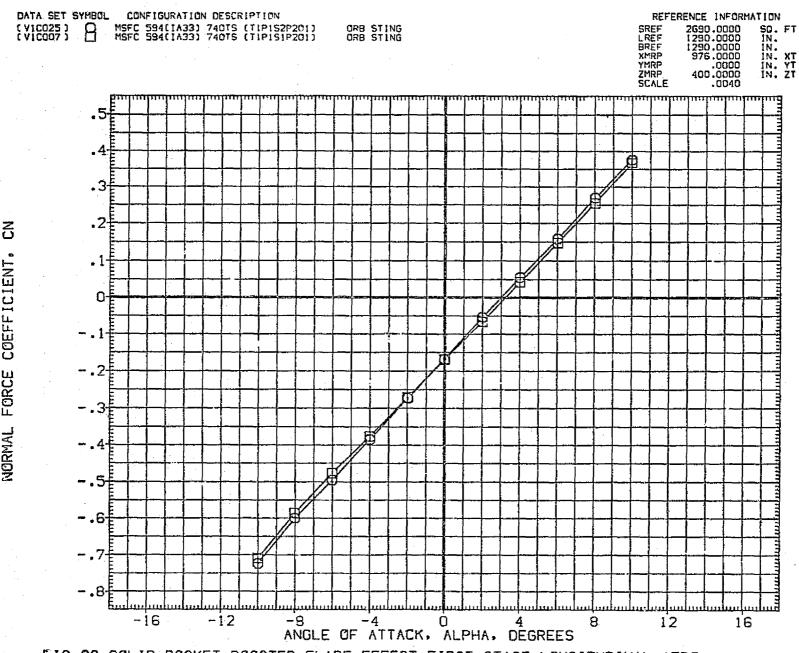
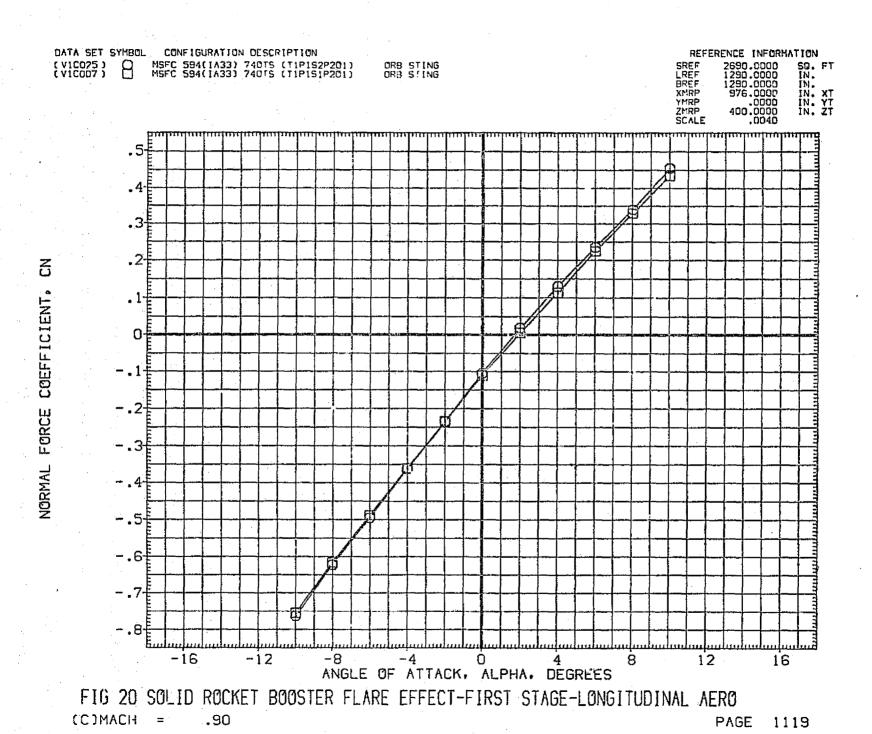
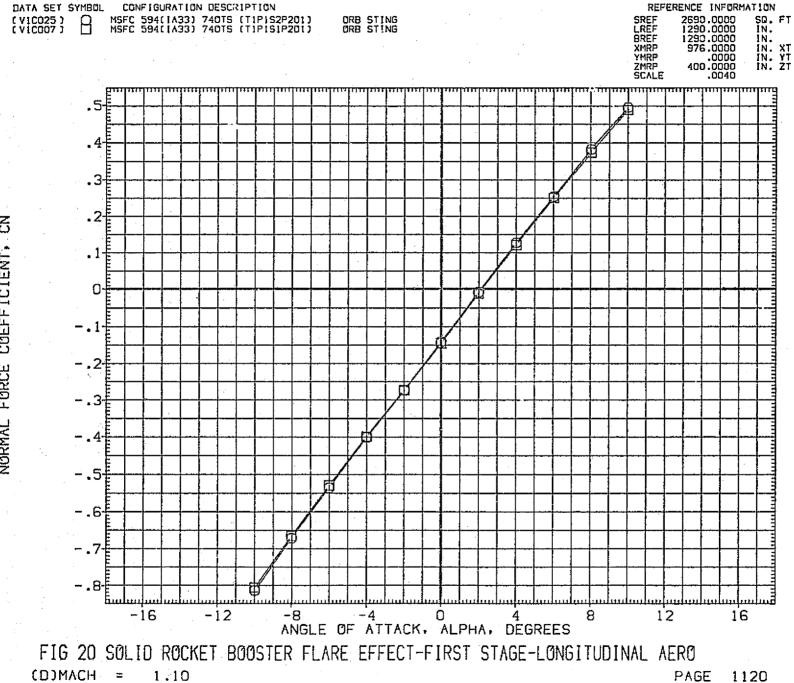


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(A)MACH = .60

PAGE 1117





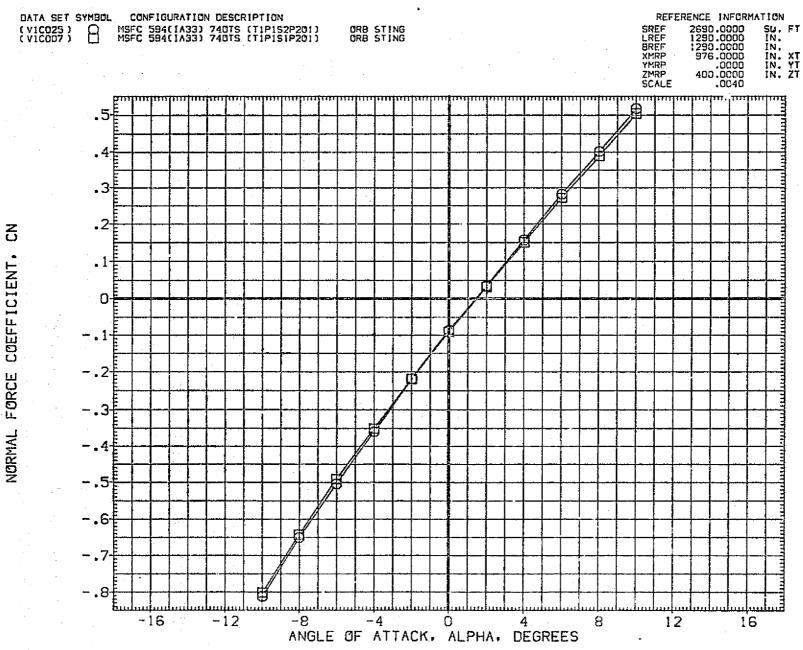


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(E)MACH = 1.25

PAGE 1121

FORCE

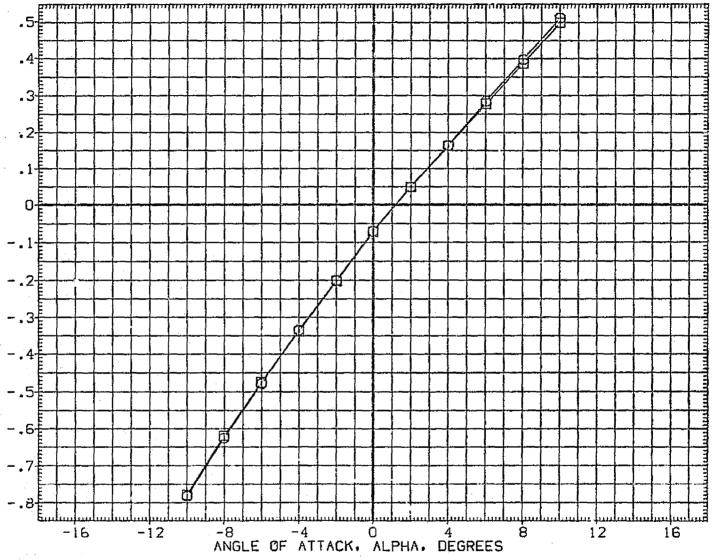
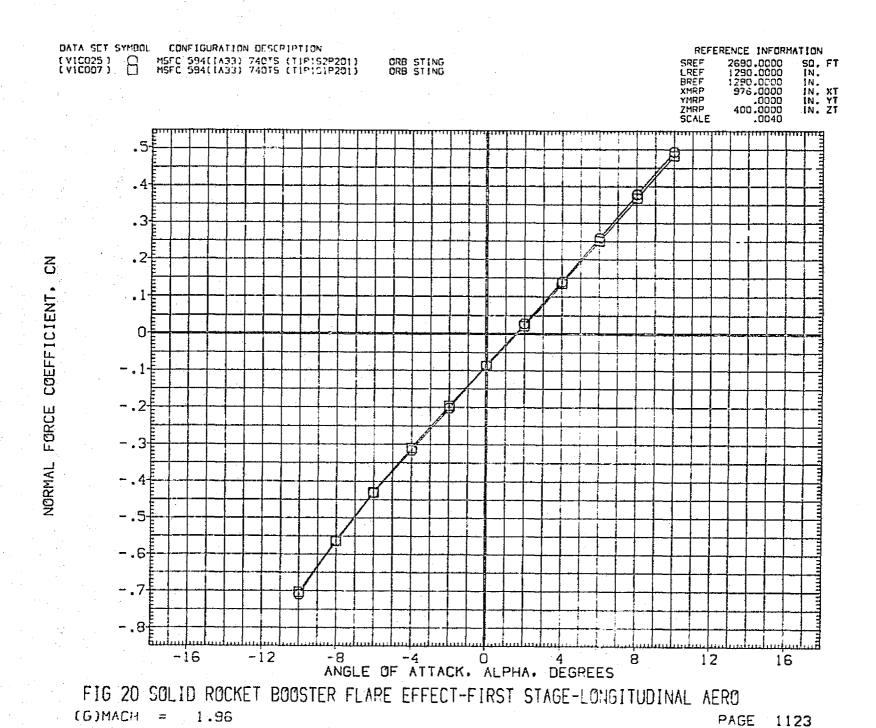
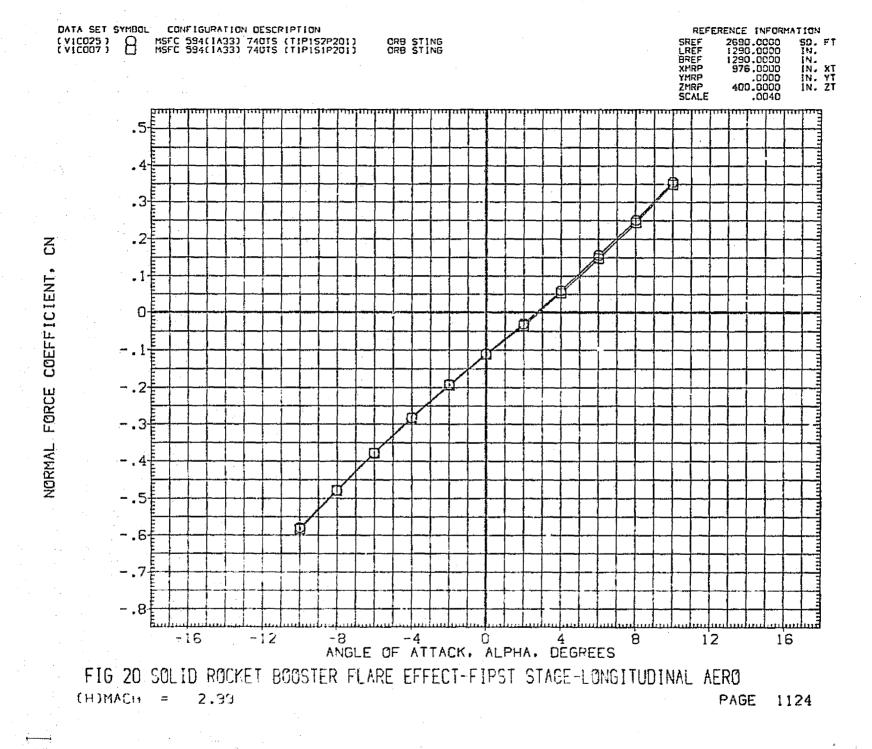


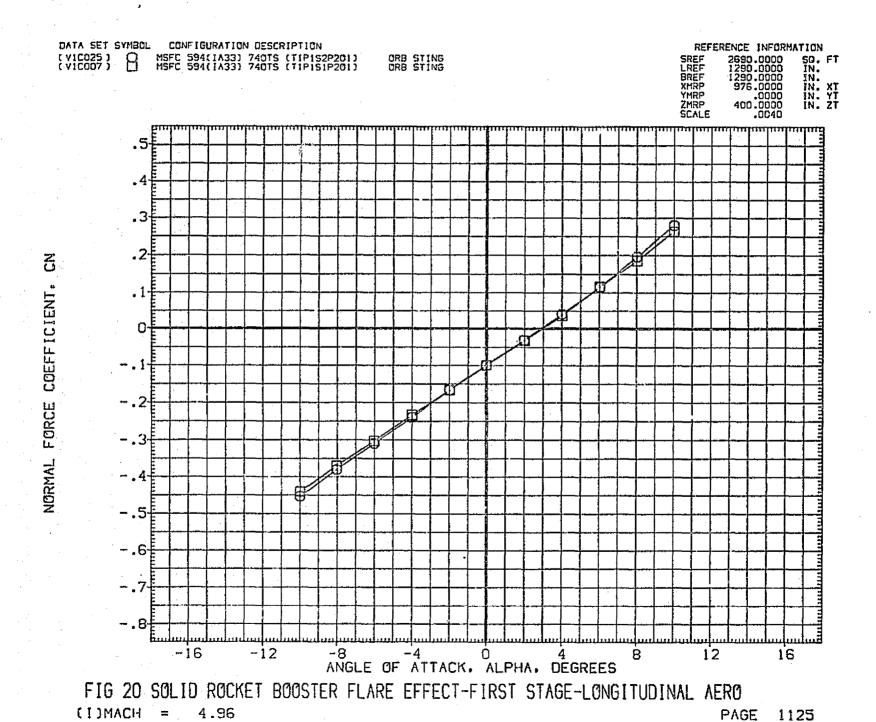
FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

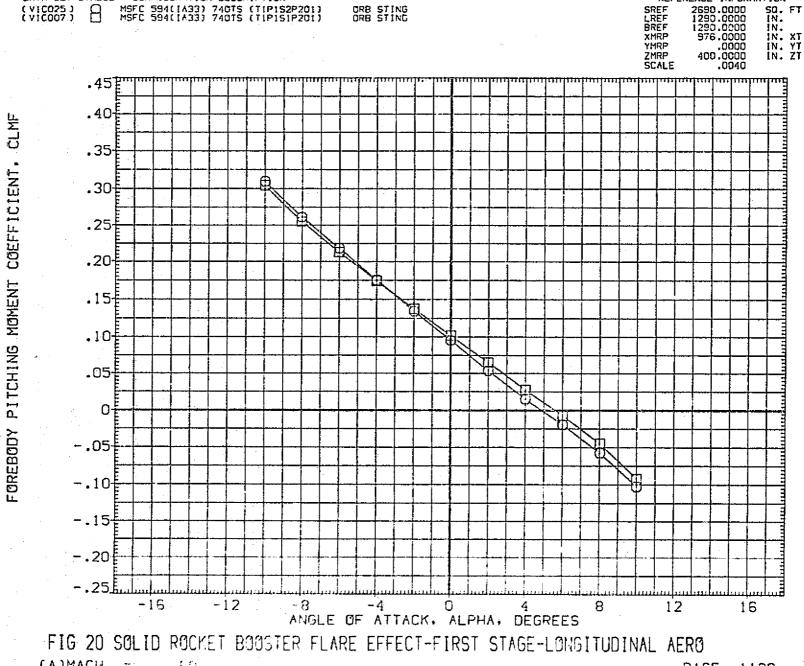
(F)MACH = 1.46

PAGE 1122





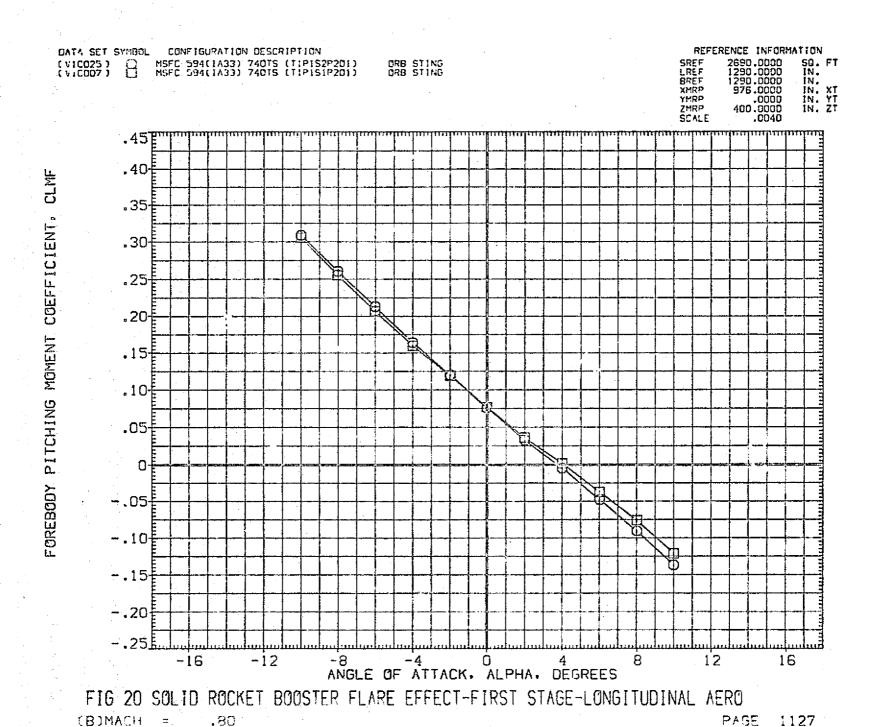


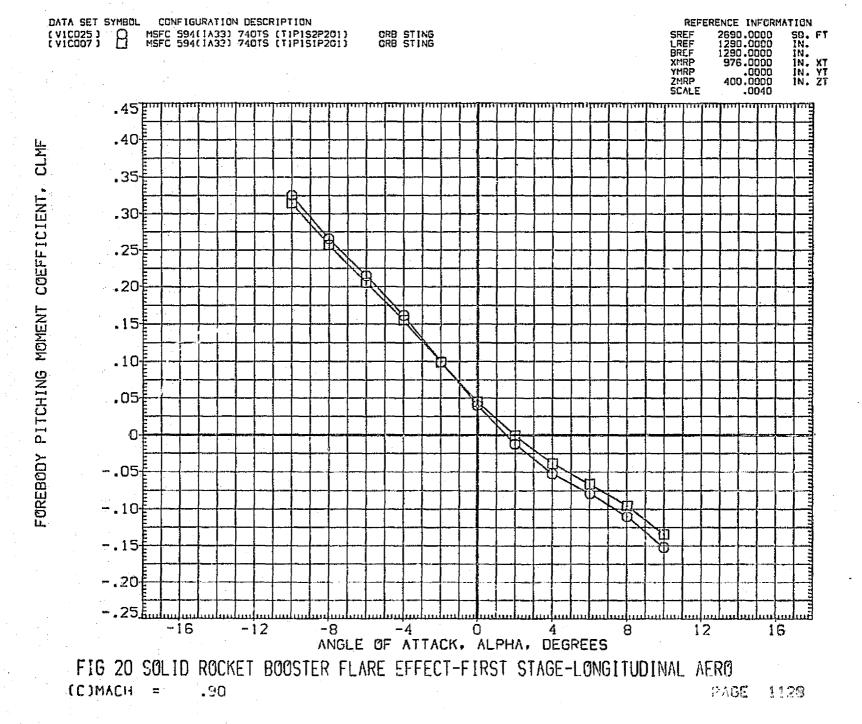


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(A)MACH = PAGE 1126





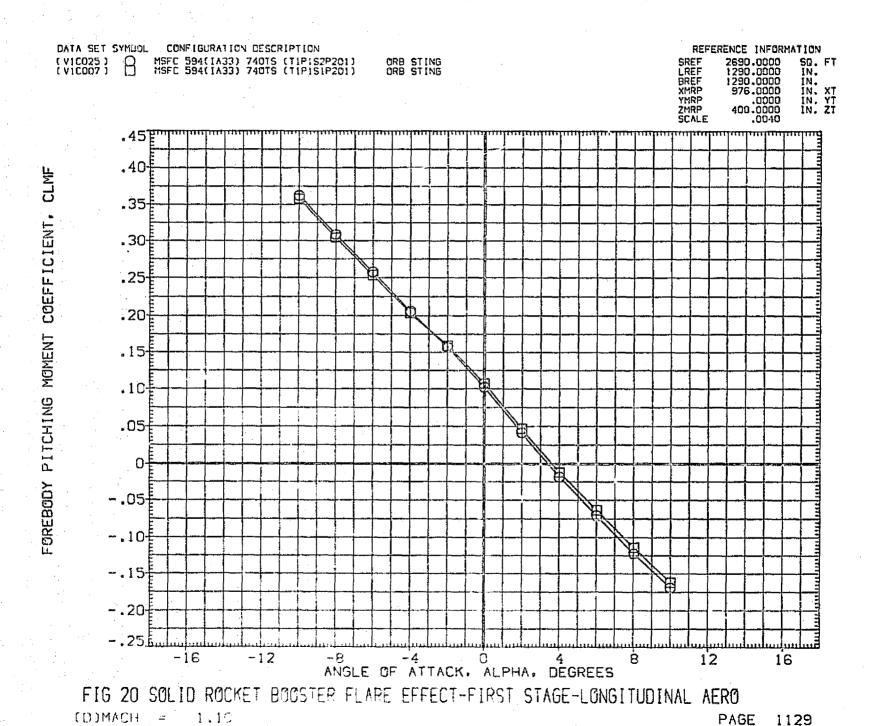


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO
PAGE 1130

ANGLE OF ATTACK, ALPHA, DEGREES

12

:6

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-16

-12

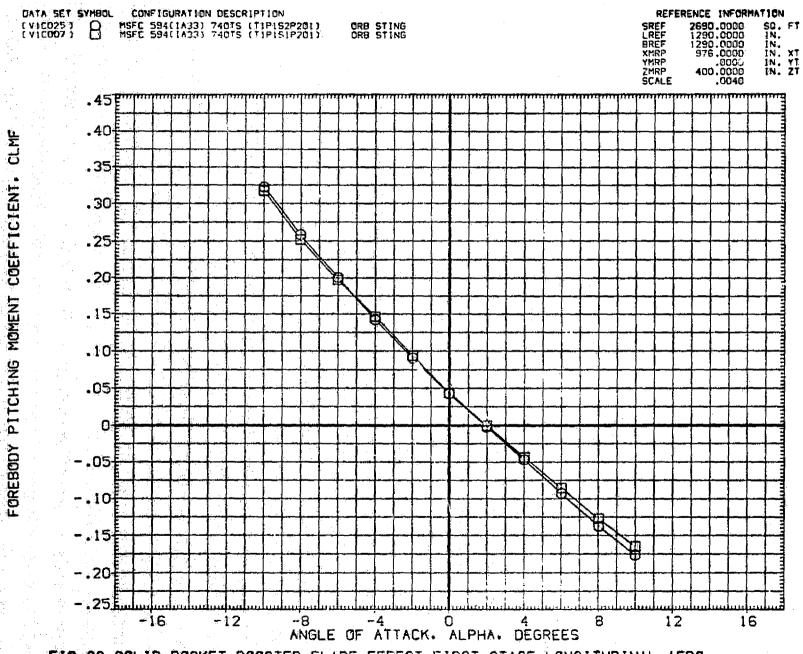
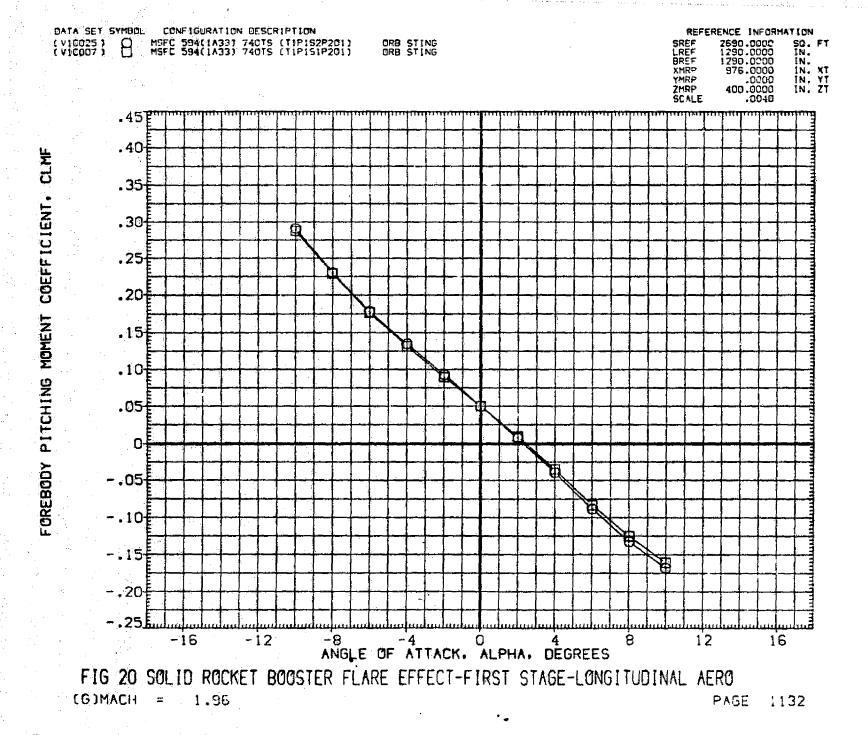


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(F)MACH = 1.46

PAGE 1131





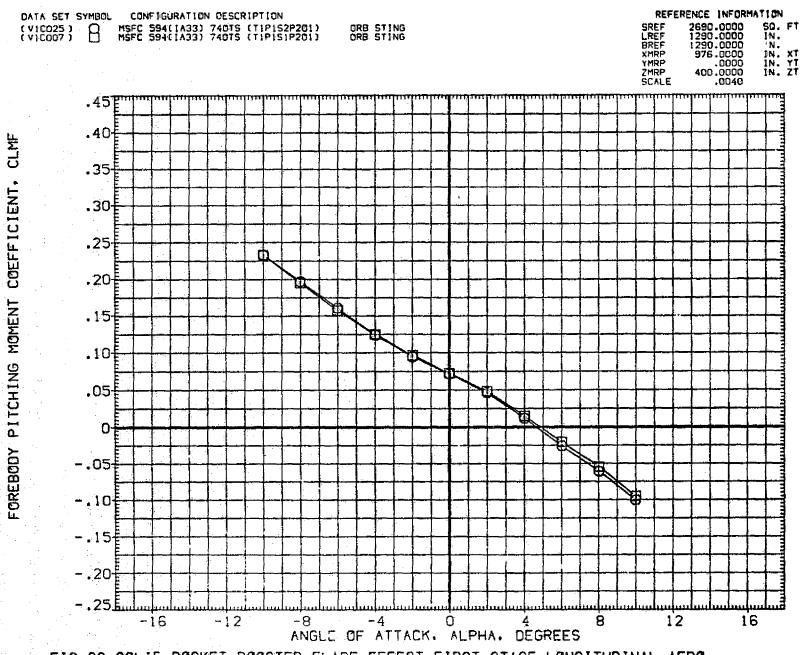
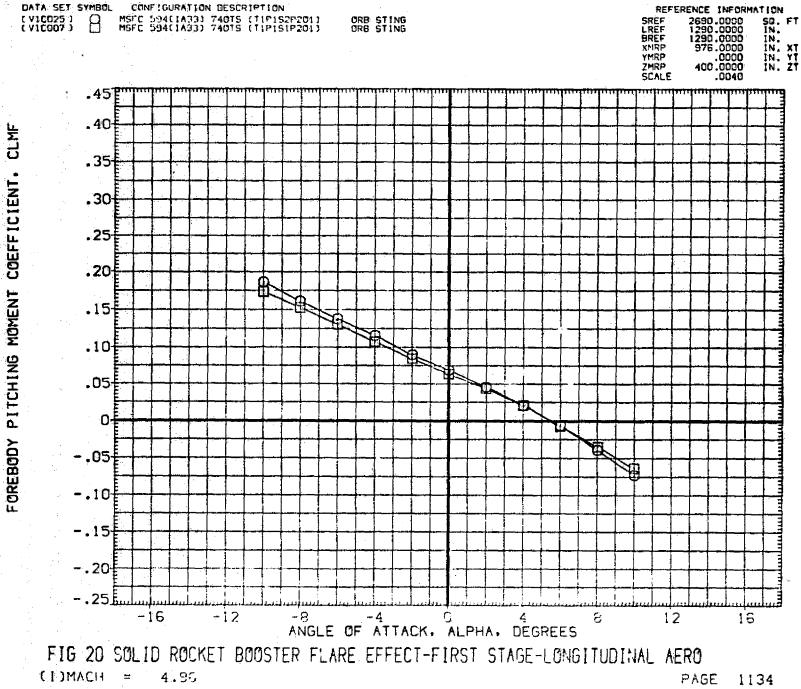
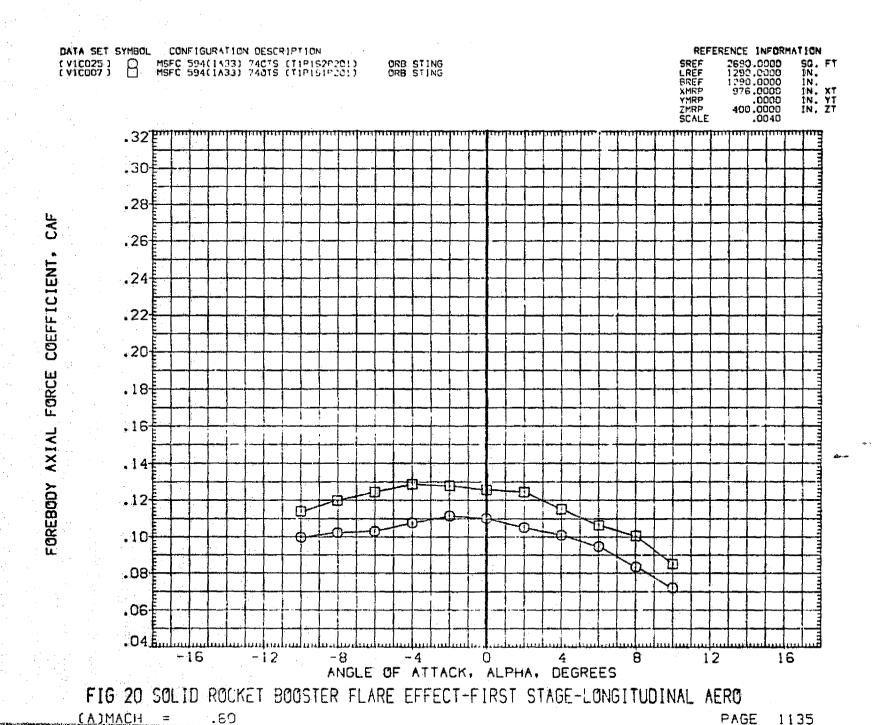


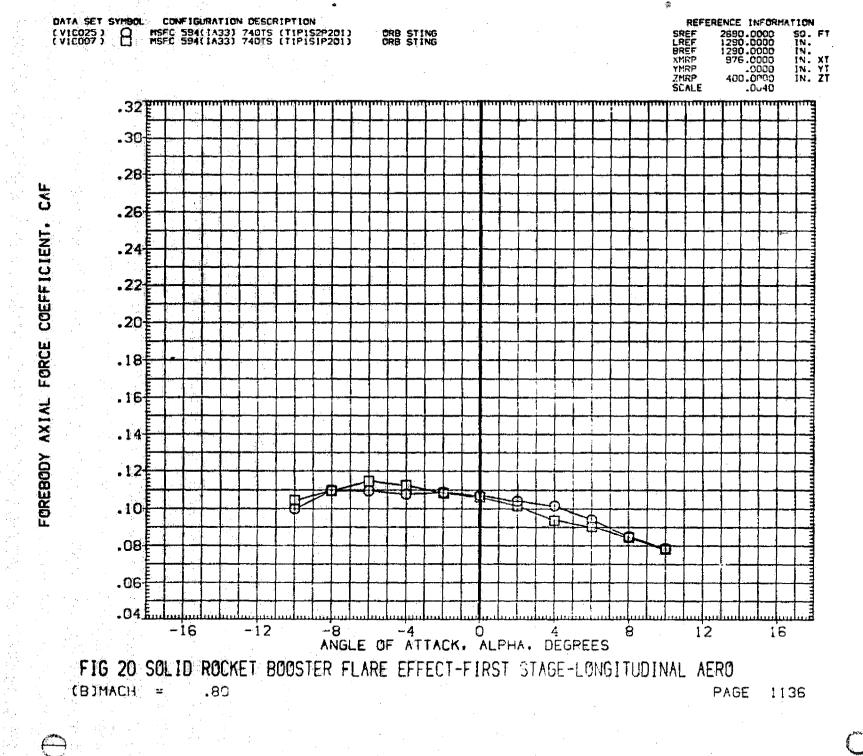
FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(H)MACH = 2.99

PAGE 1133







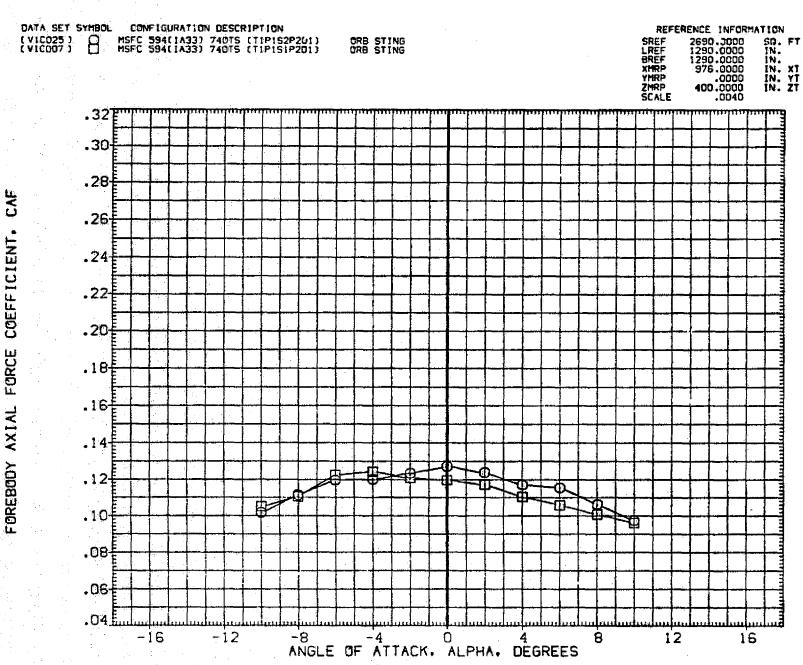
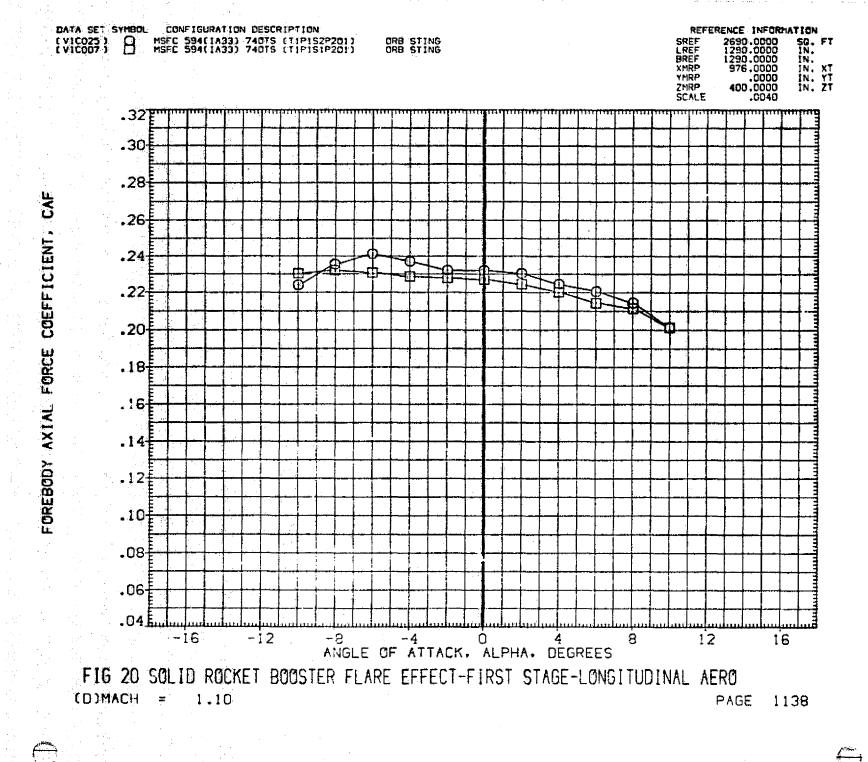


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

Ce. = HOAMCC

PAGE 1137



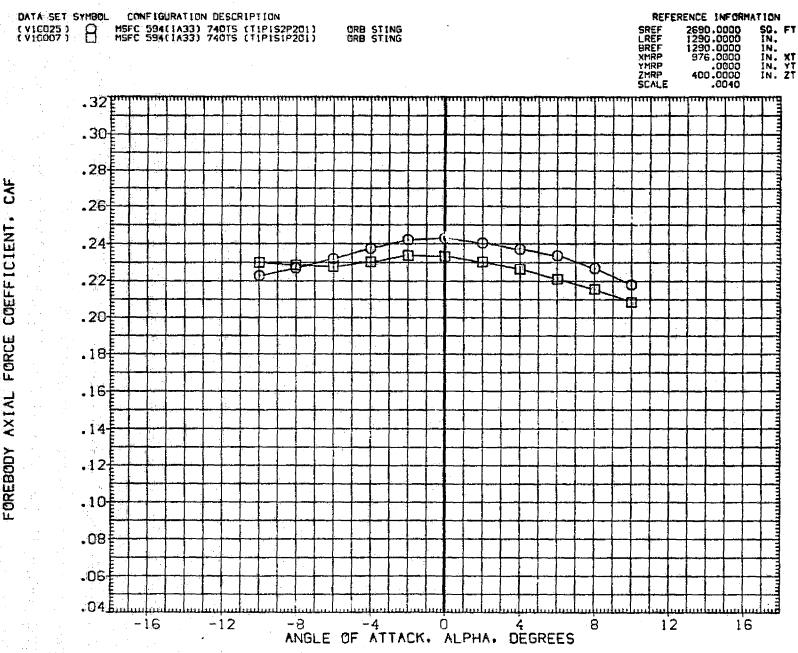
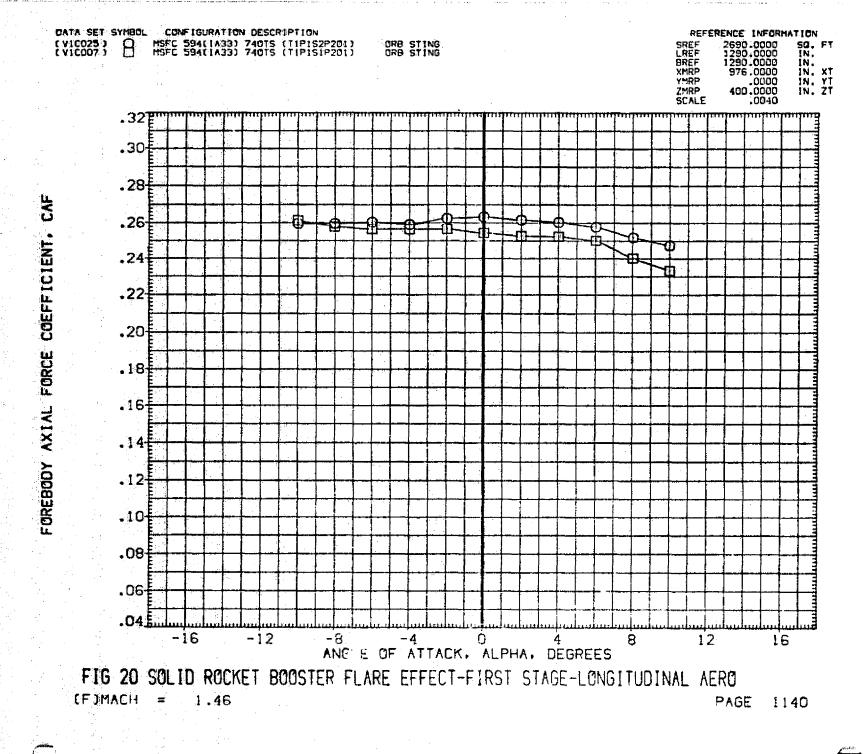


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO
PAGE 1139



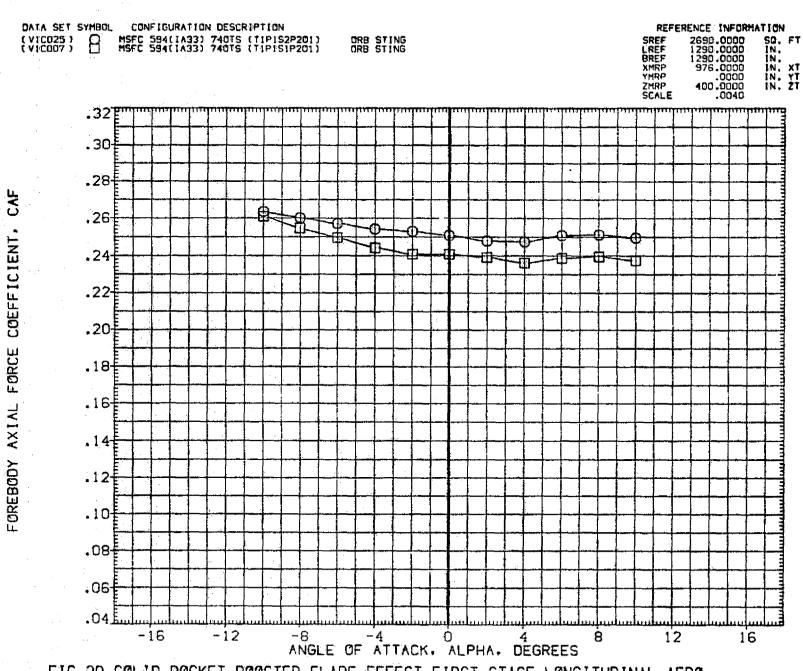
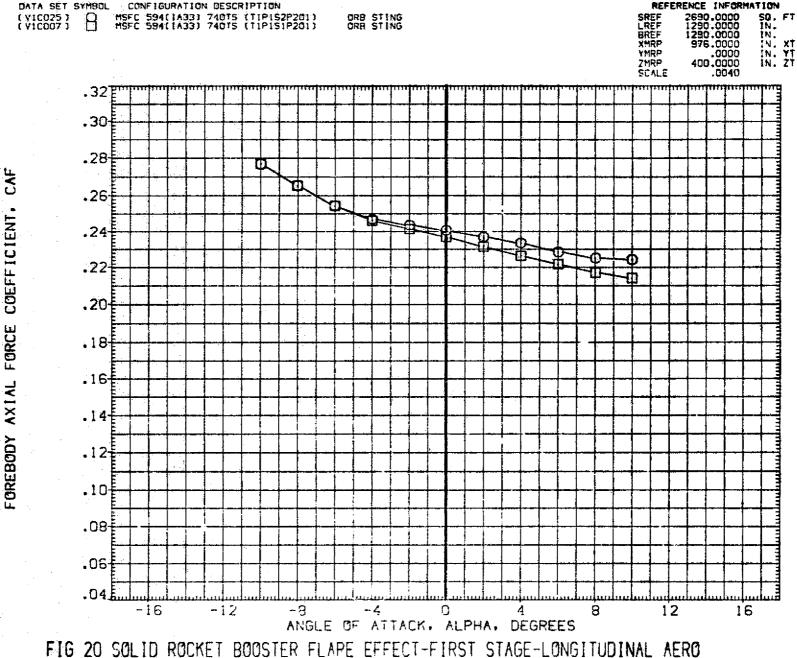


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(G)MACH = 1.96

PAGE

1141



REFERENCE INFORMATION

(H)MACH = 2.33PAGE 1142

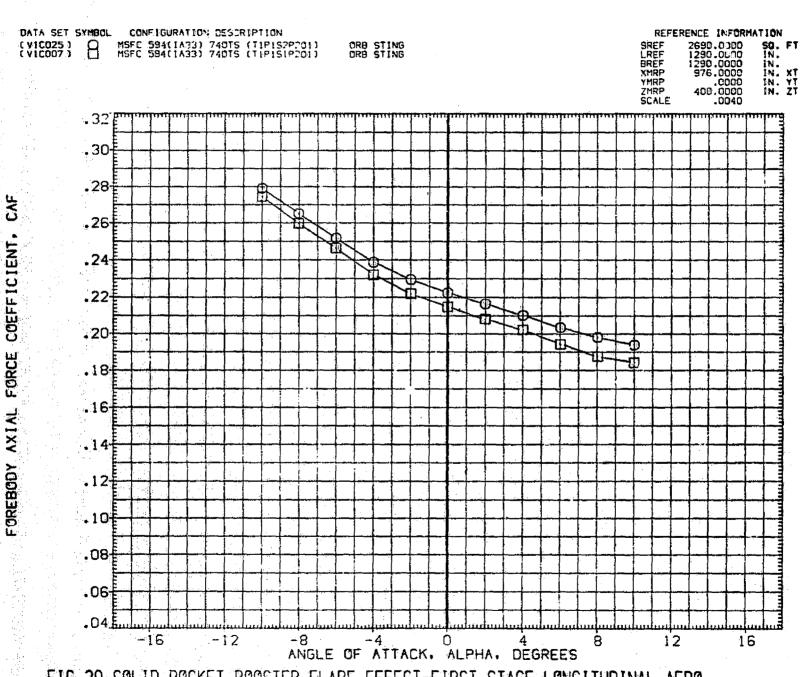
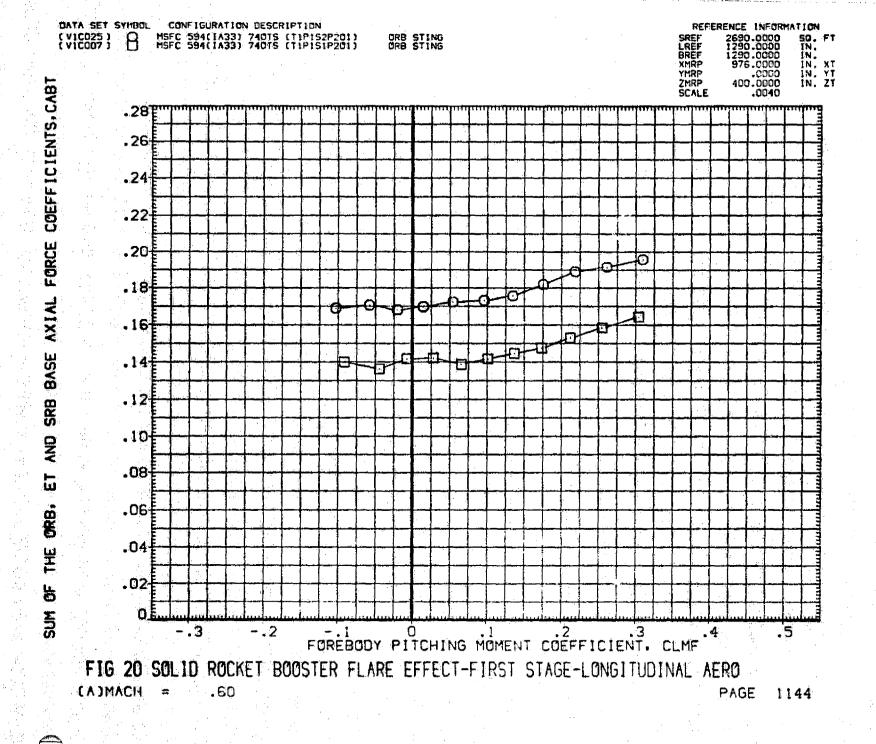
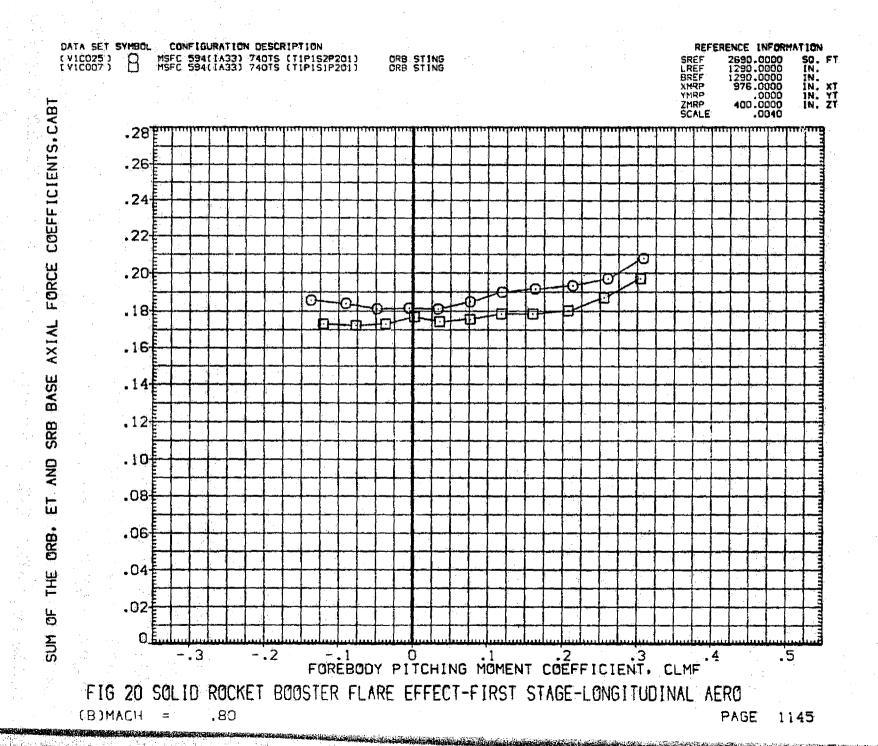


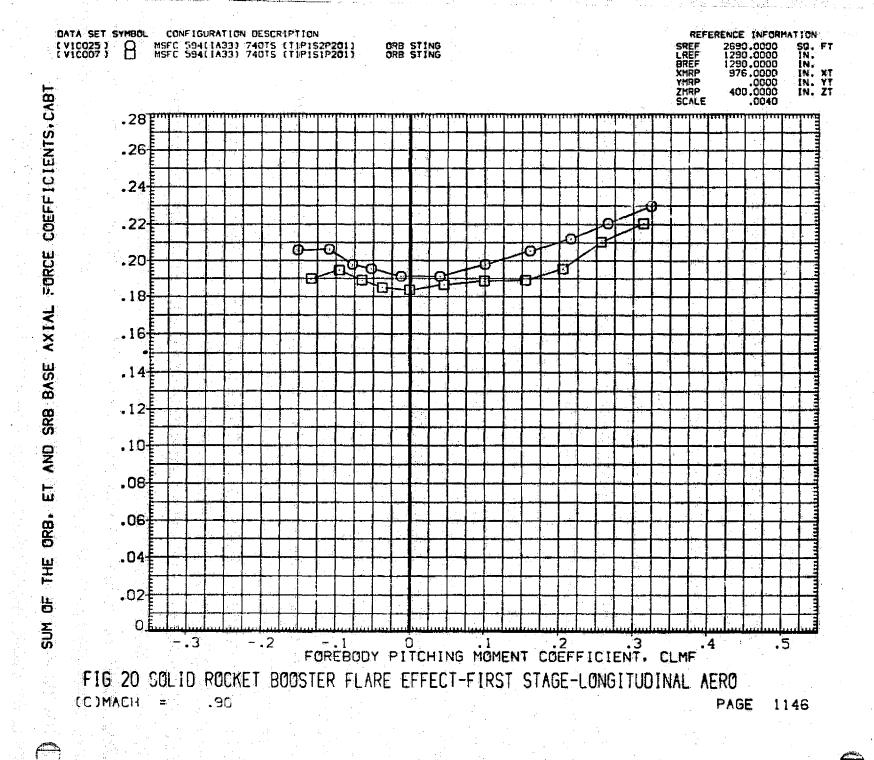
FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

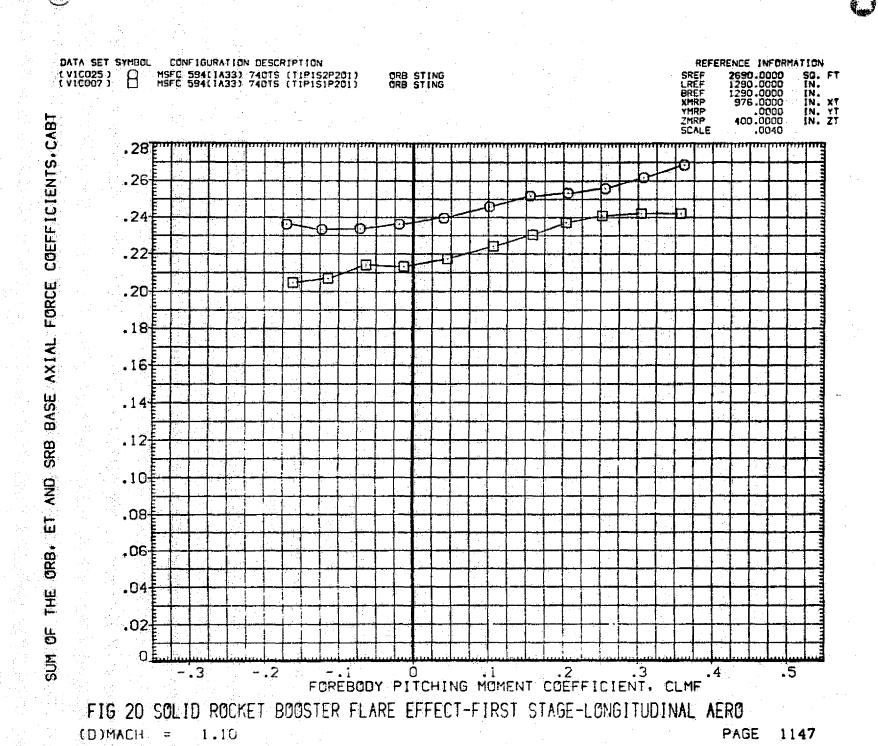
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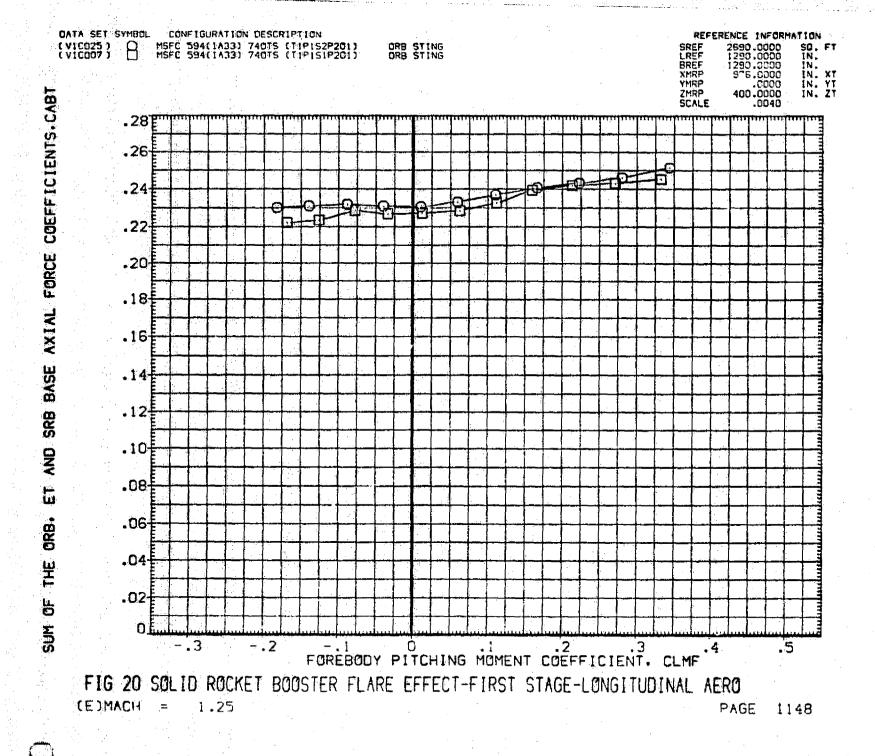
PAGE 1143

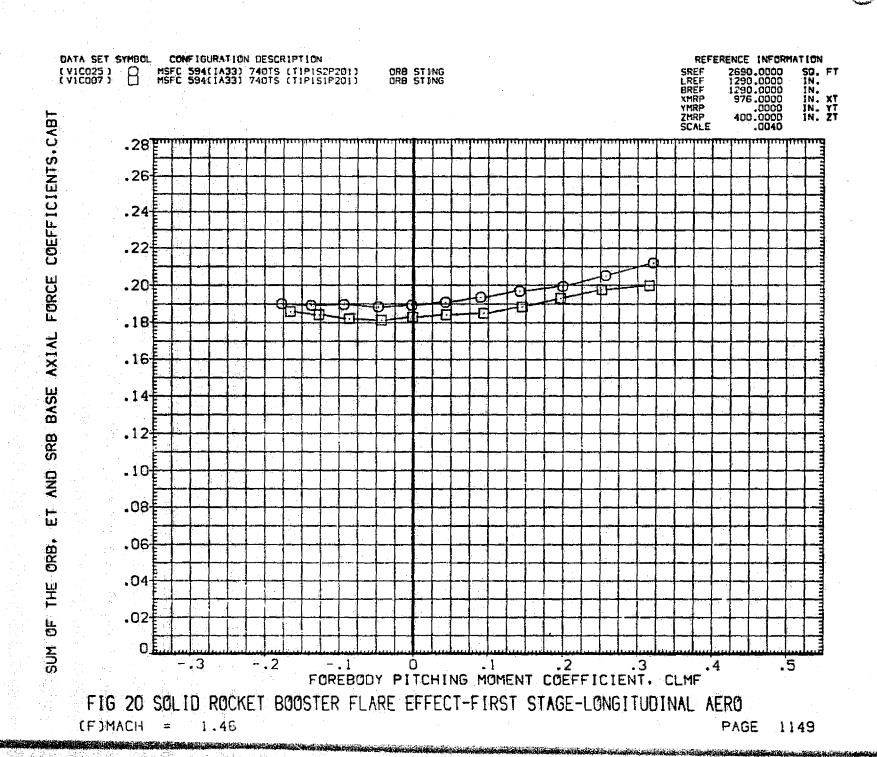


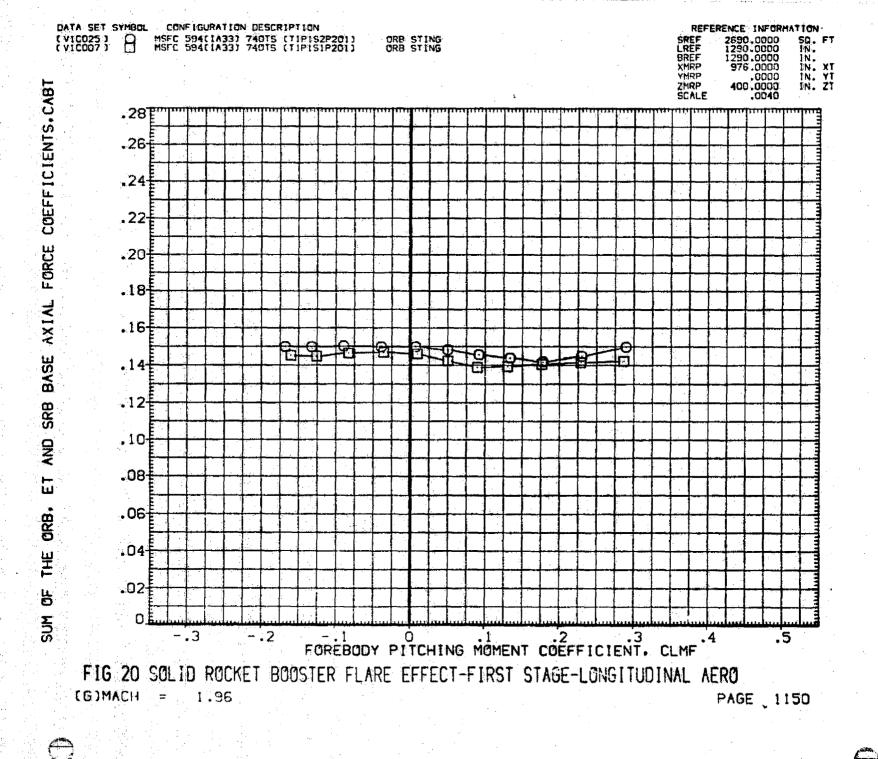


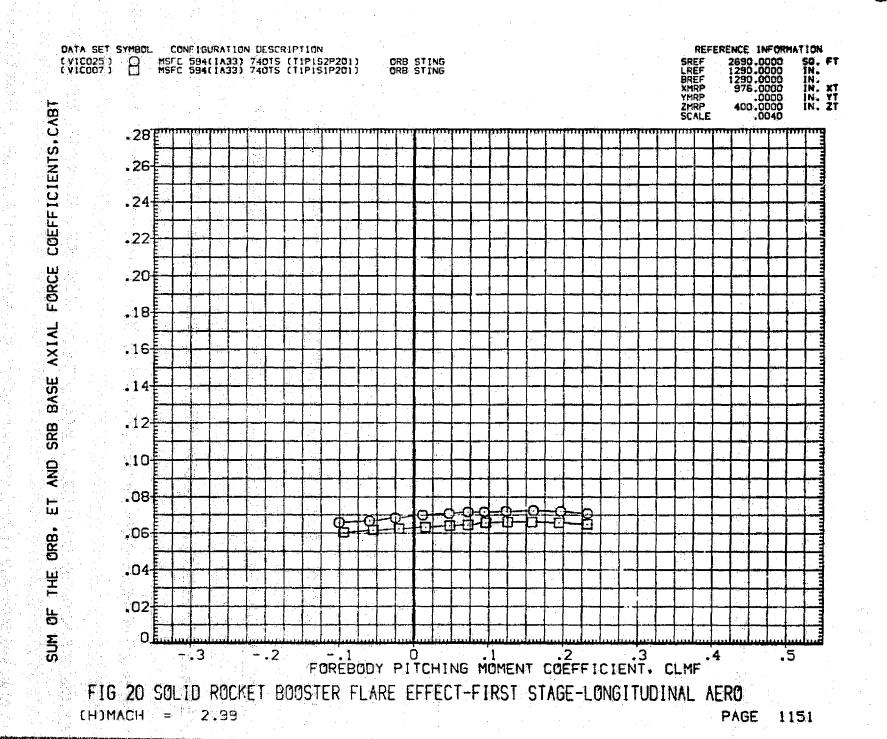


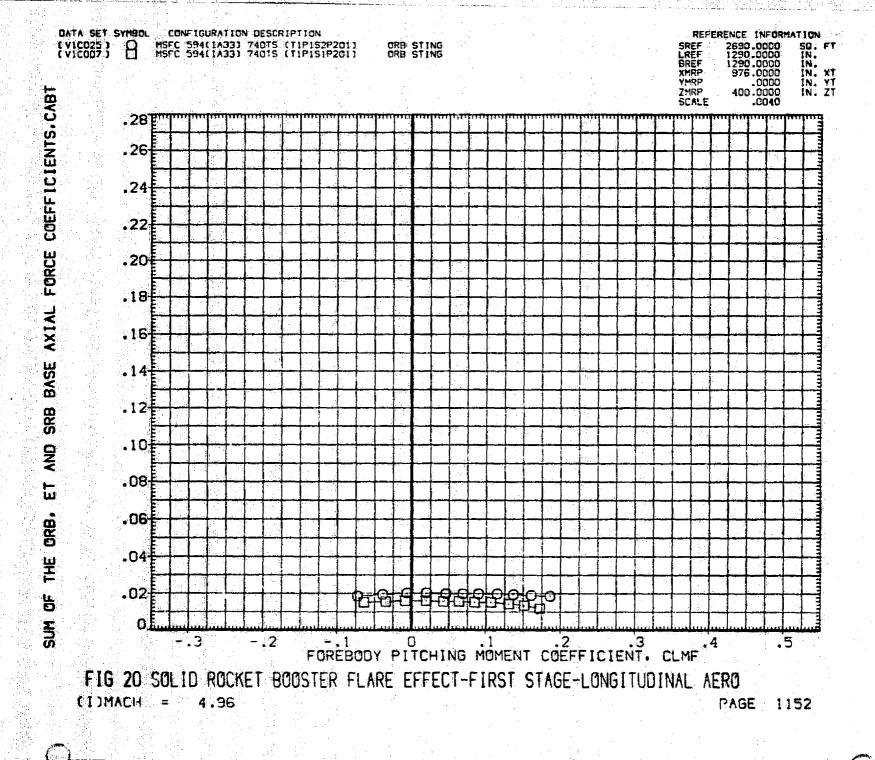


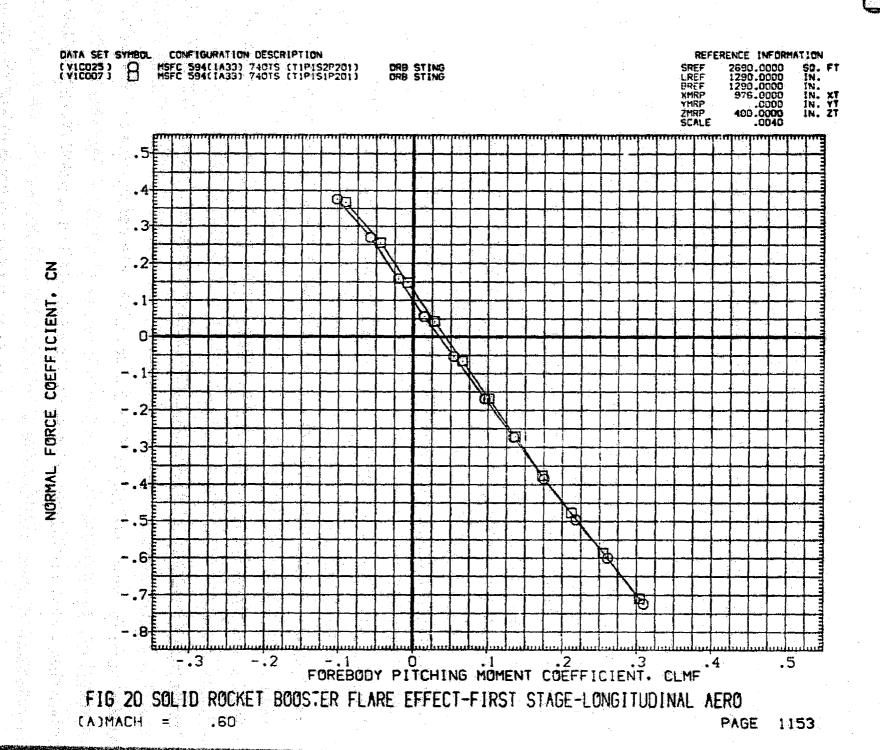


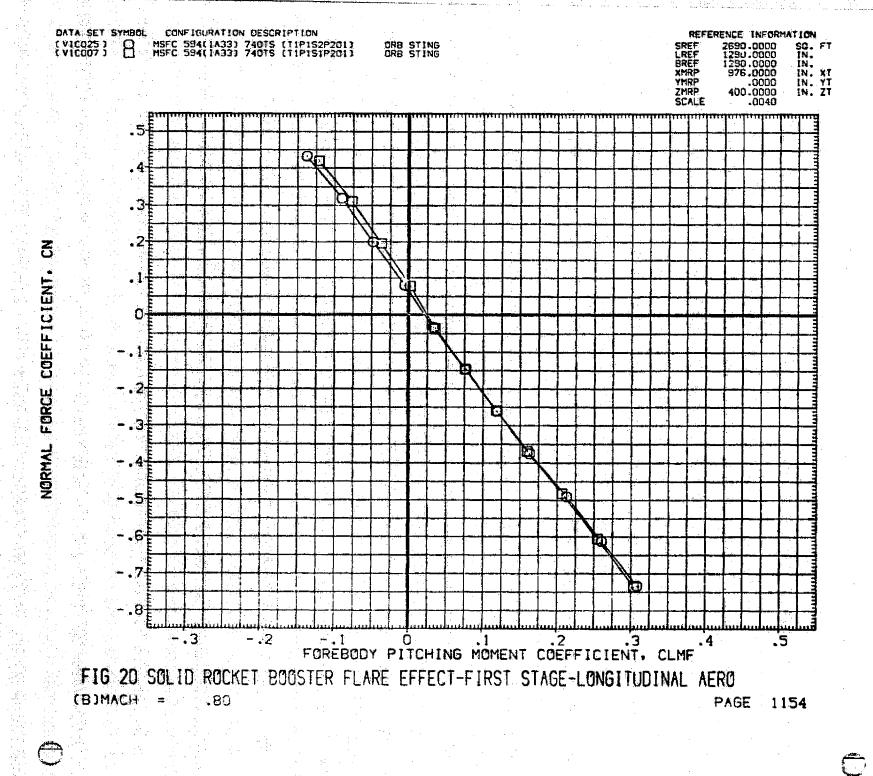


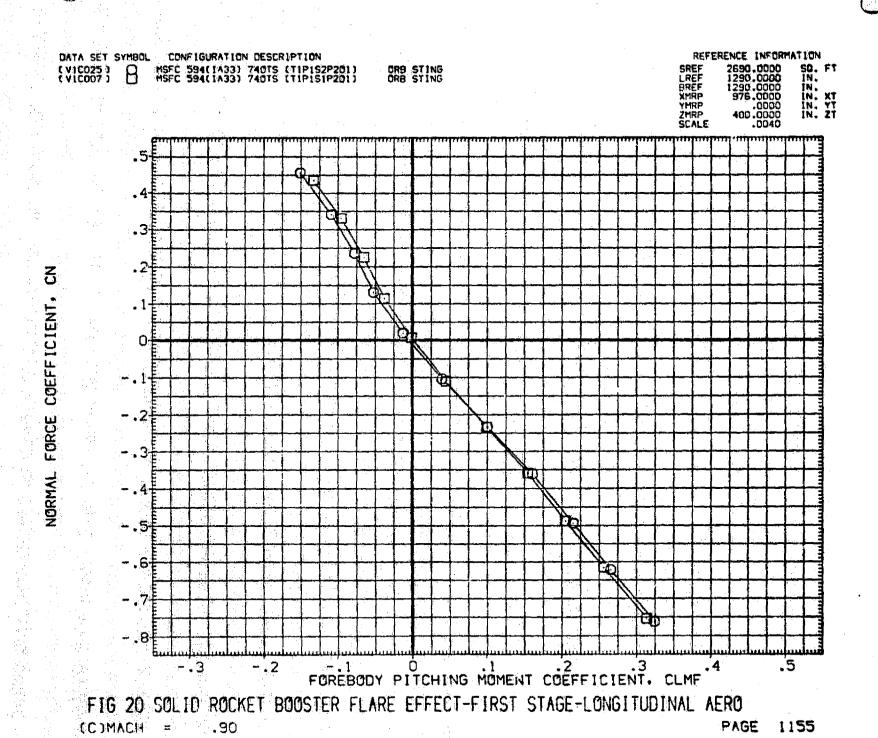


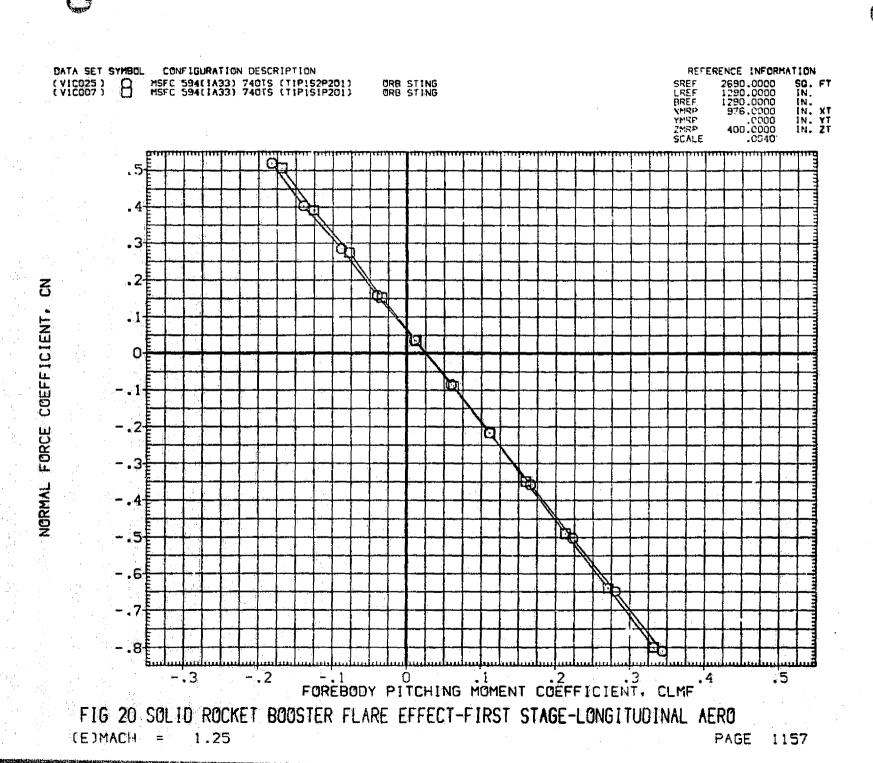


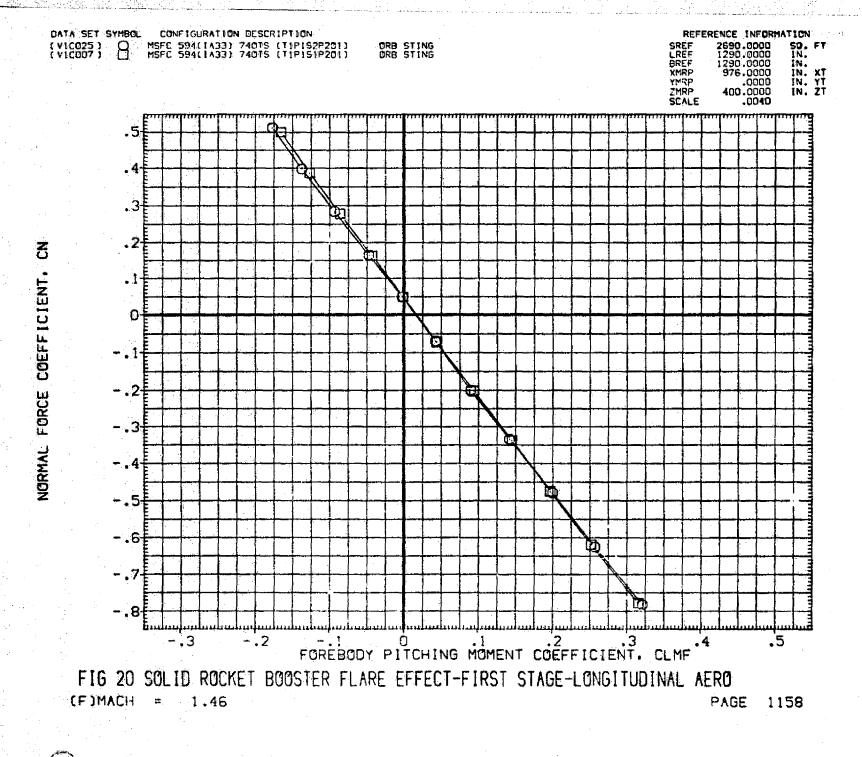














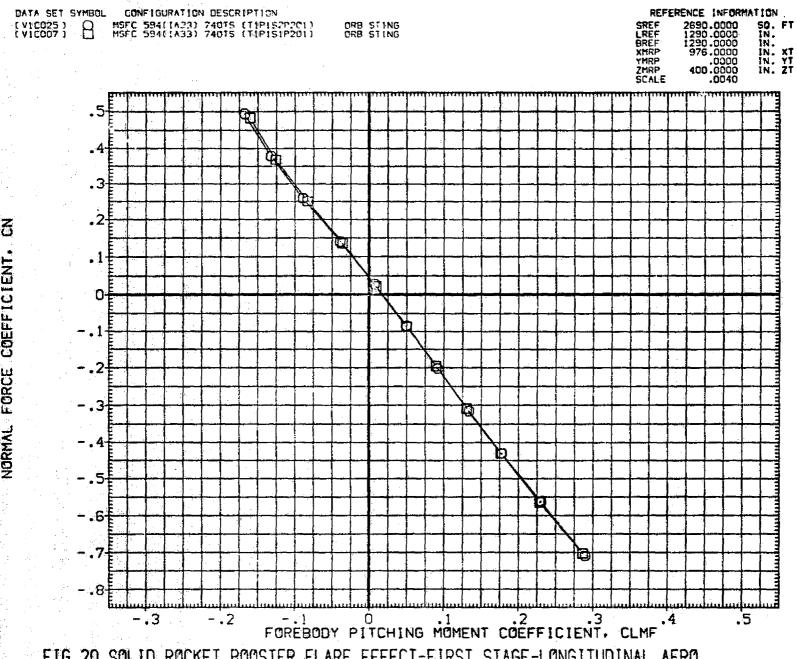
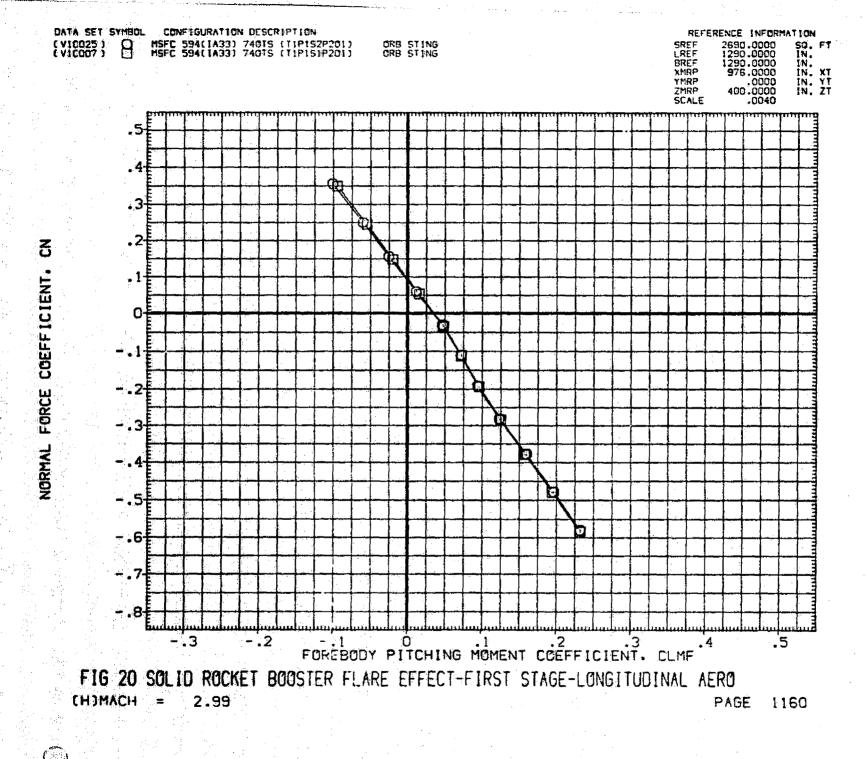
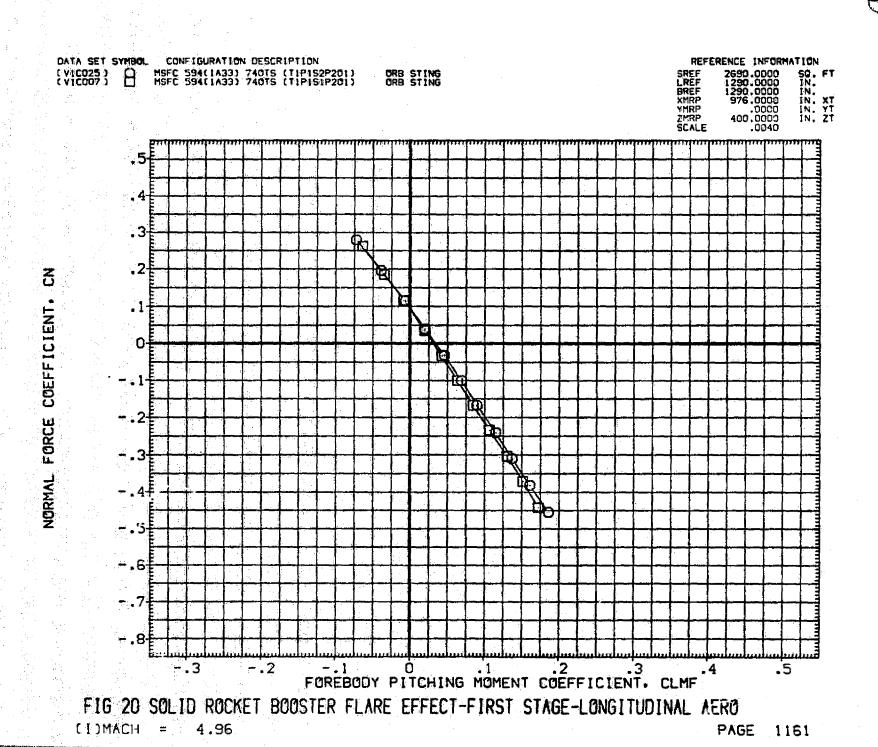
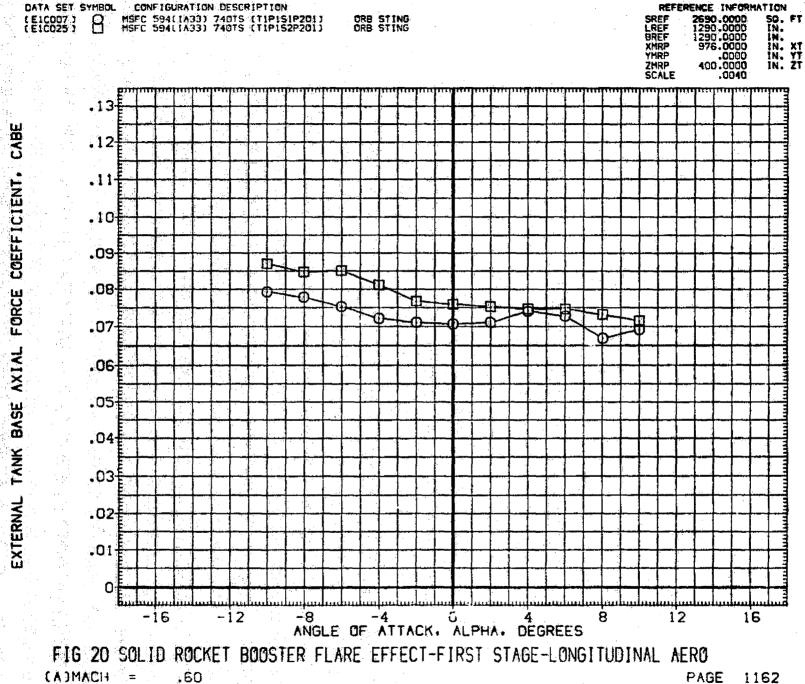


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

PAGE 1159







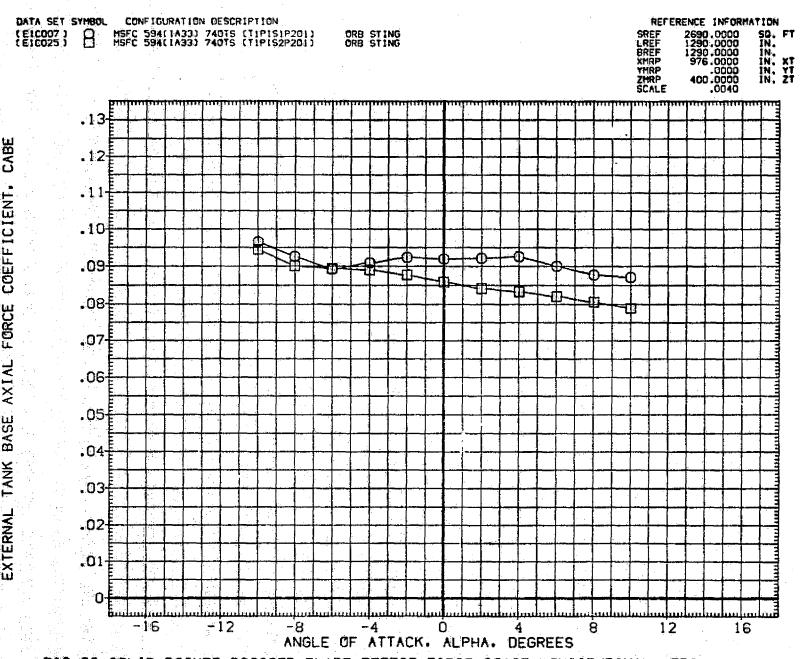
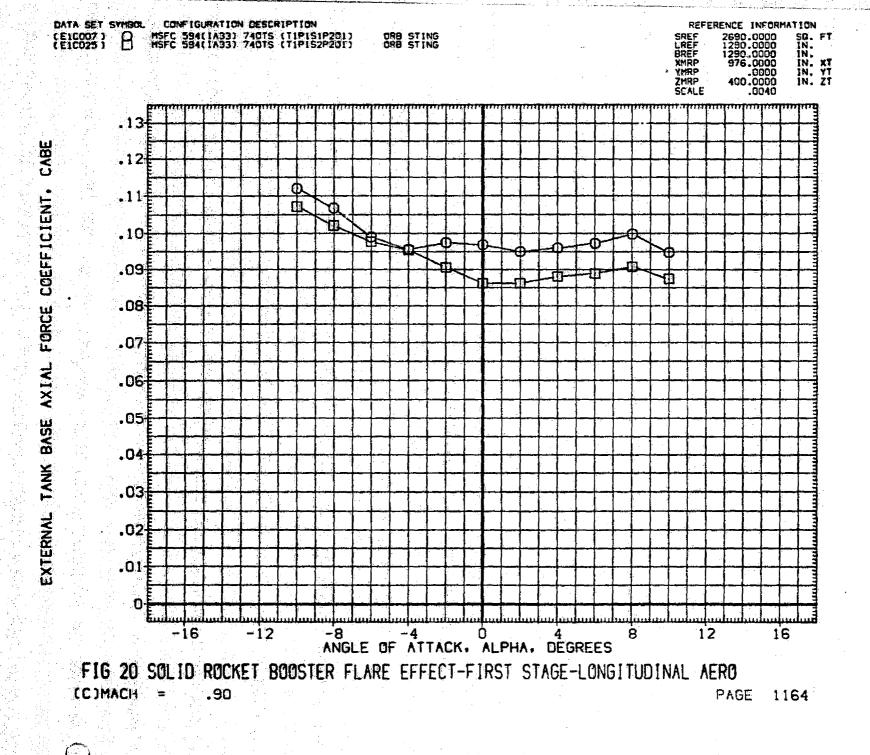
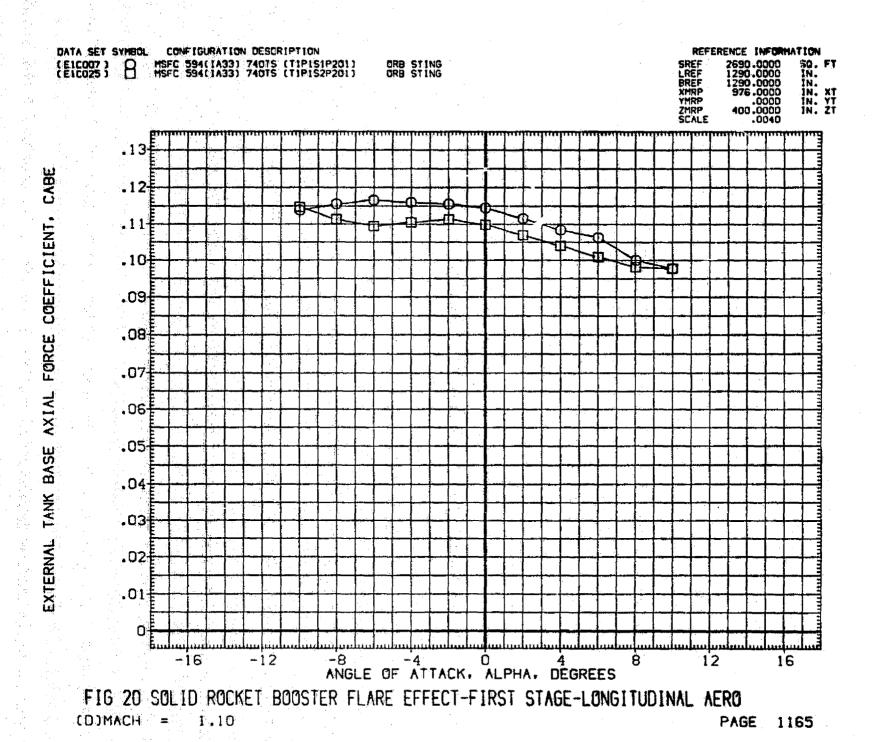


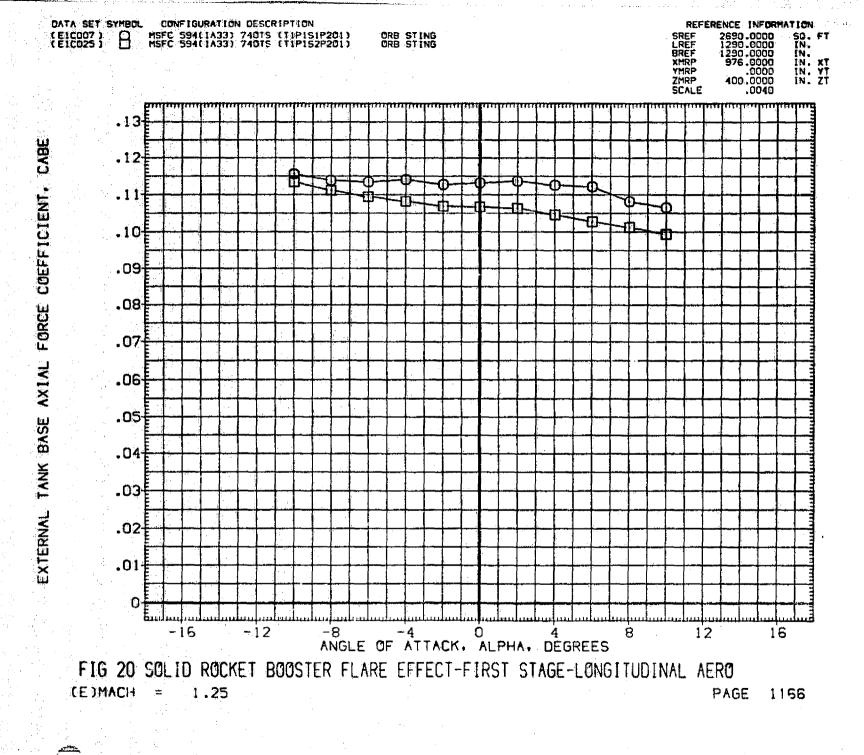
FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(B)MACH = .80

PAGE 1163







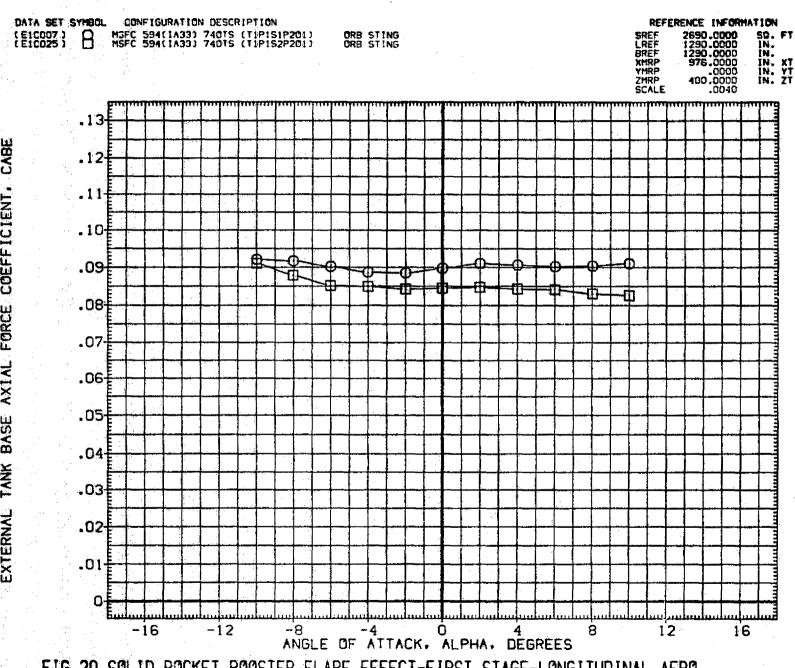
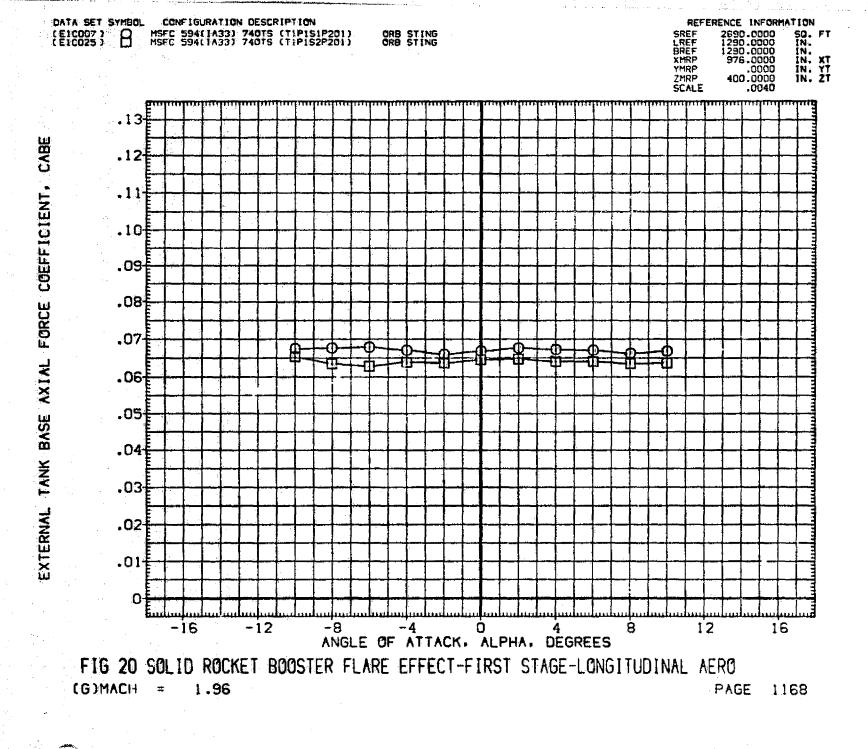
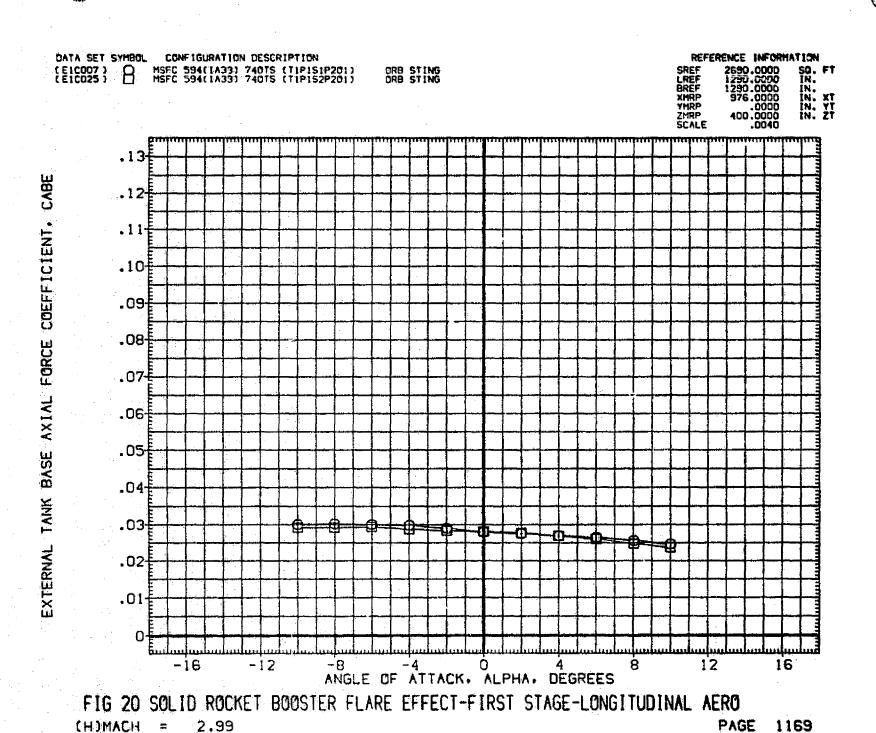
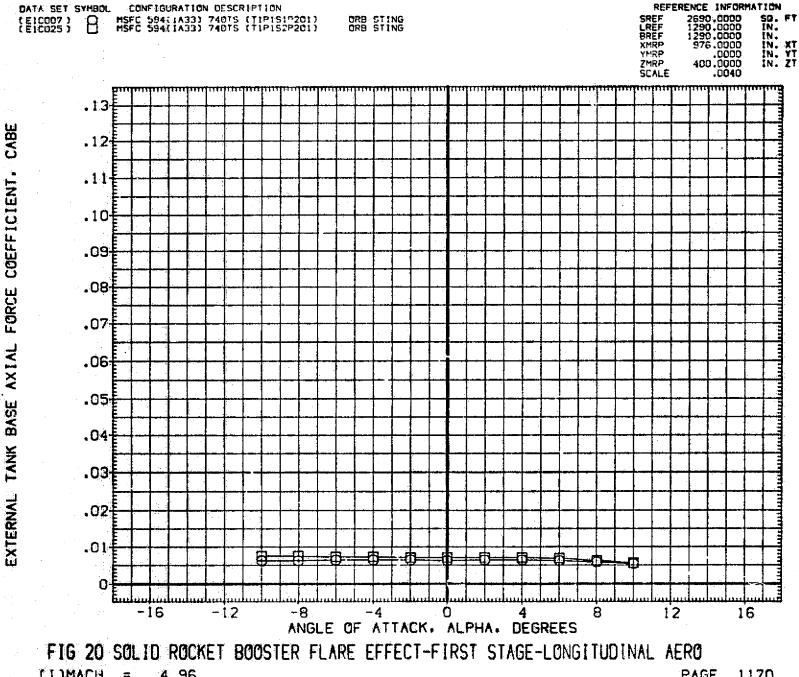


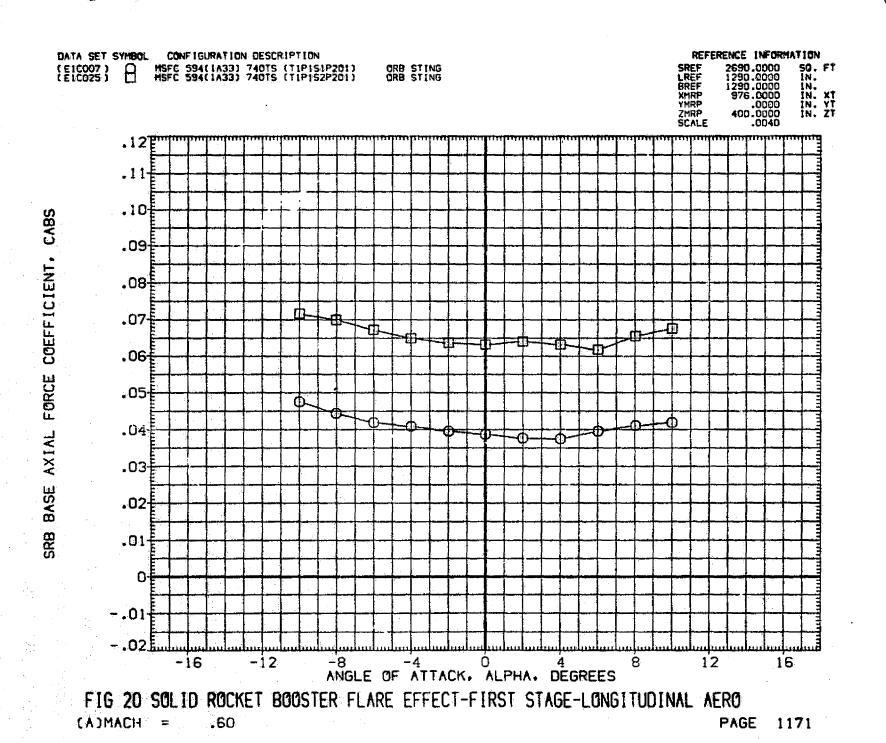
FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO
PAGE 1167

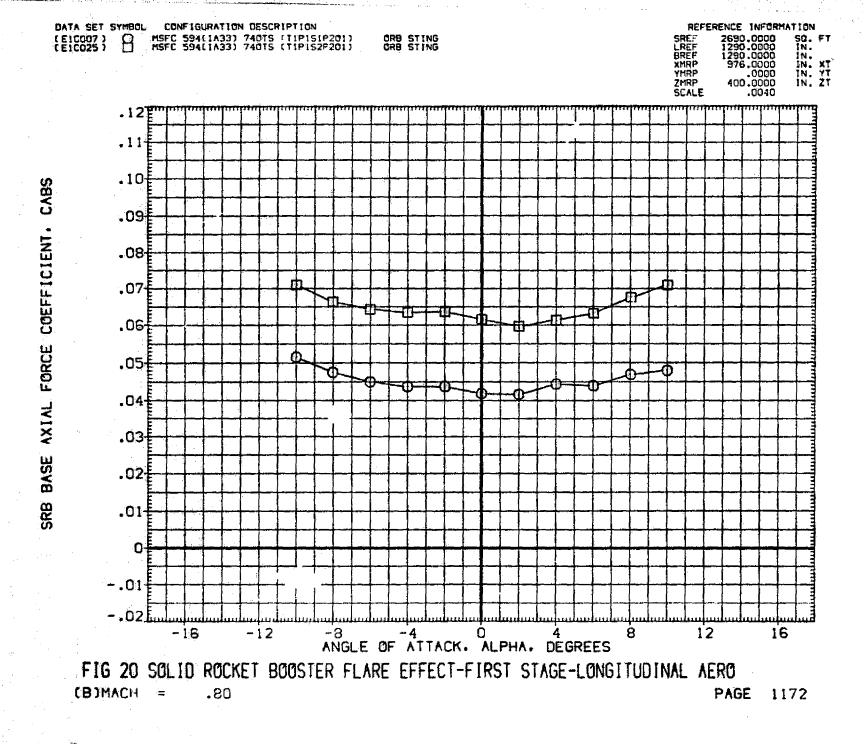






CIDMACH = PAGE 4.96 1170





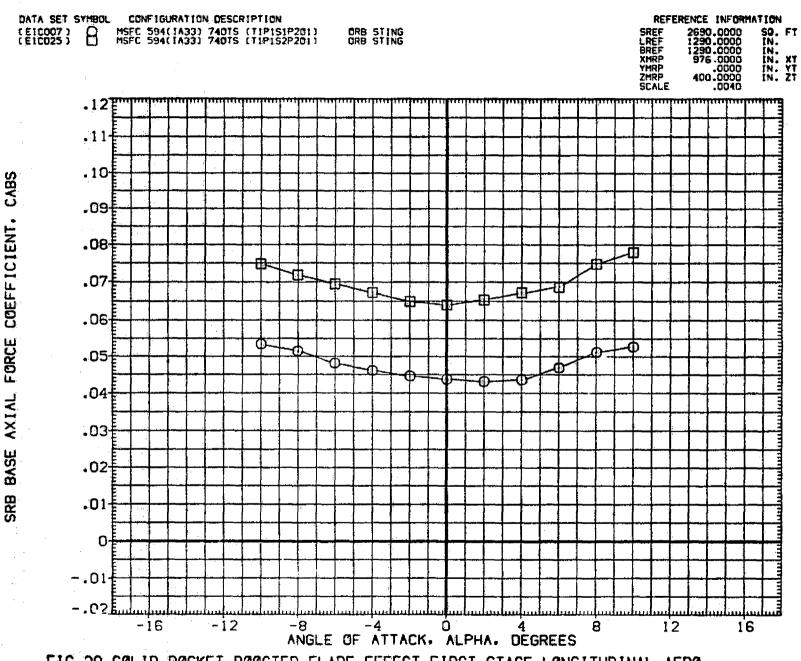
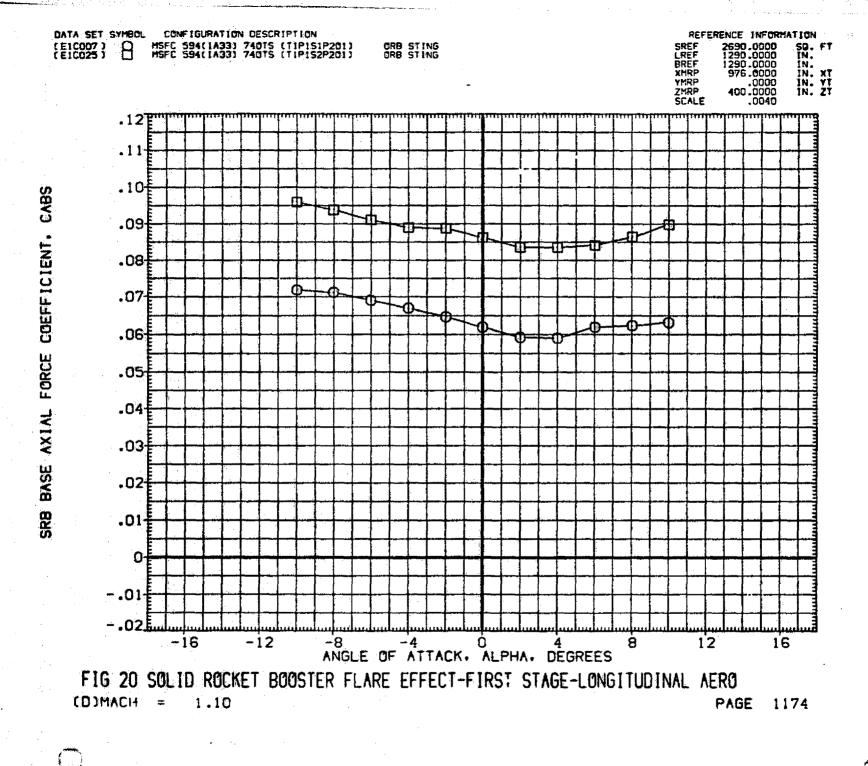
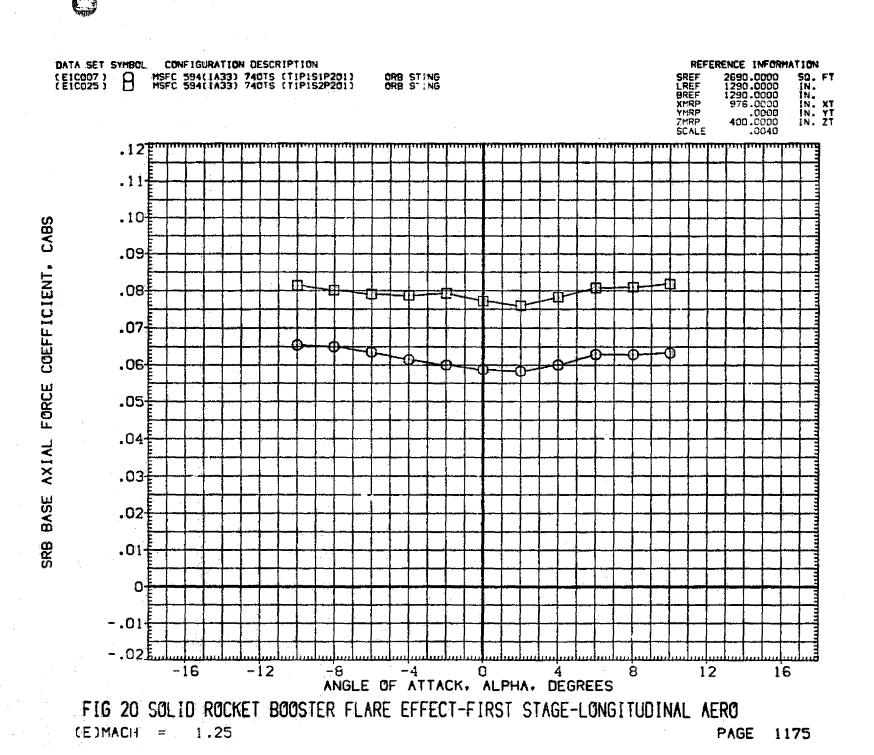
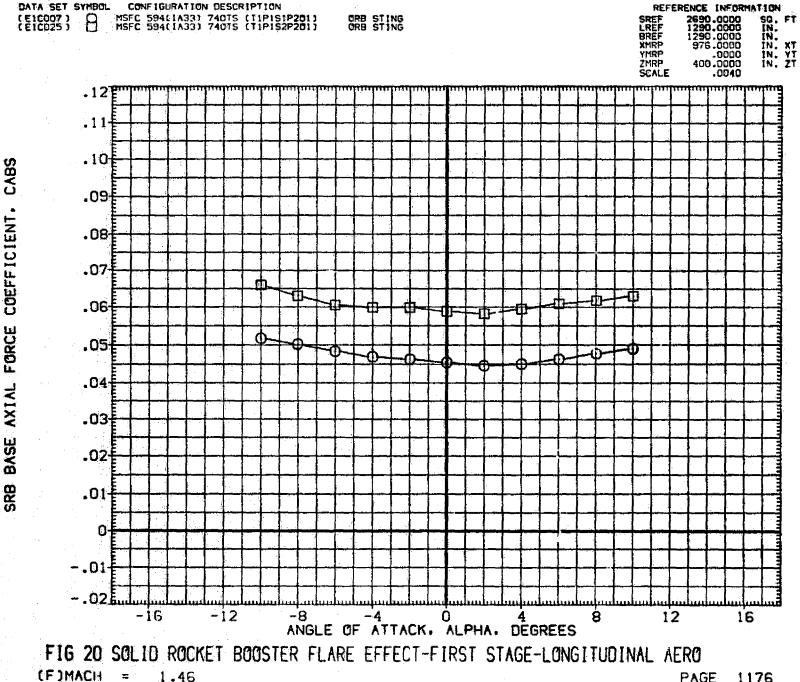


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

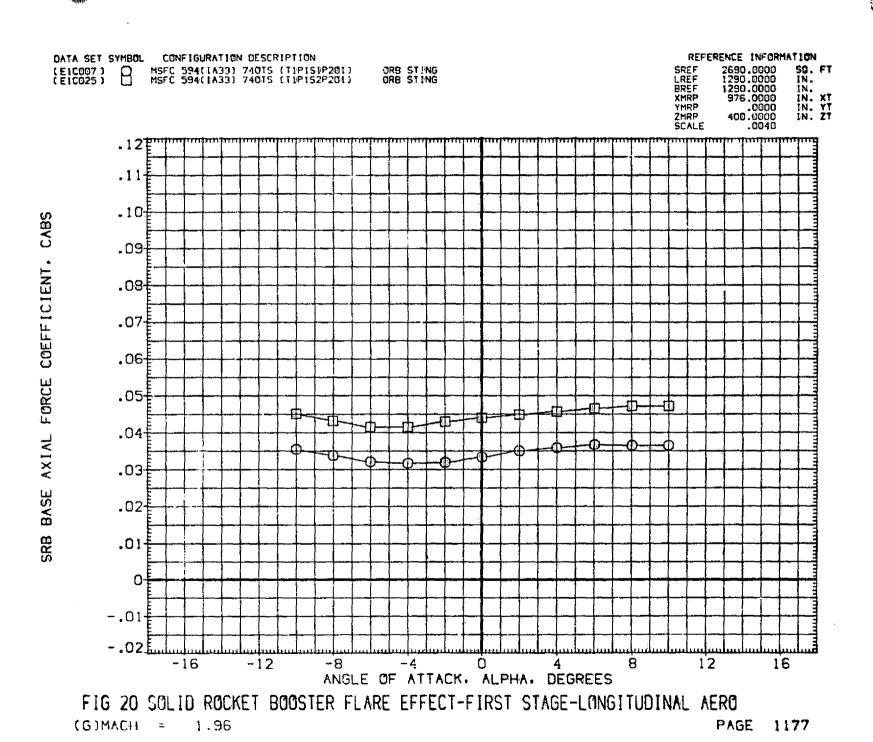
COMACH = .90 PAGE 1173







(F)MACH = 1.46 PAGE 1176



amount of the committee of the committee

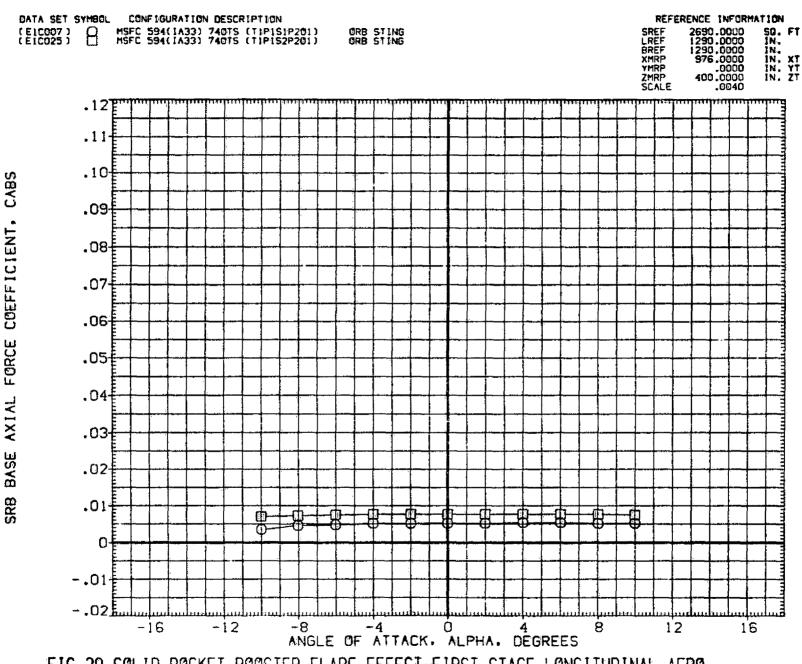


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

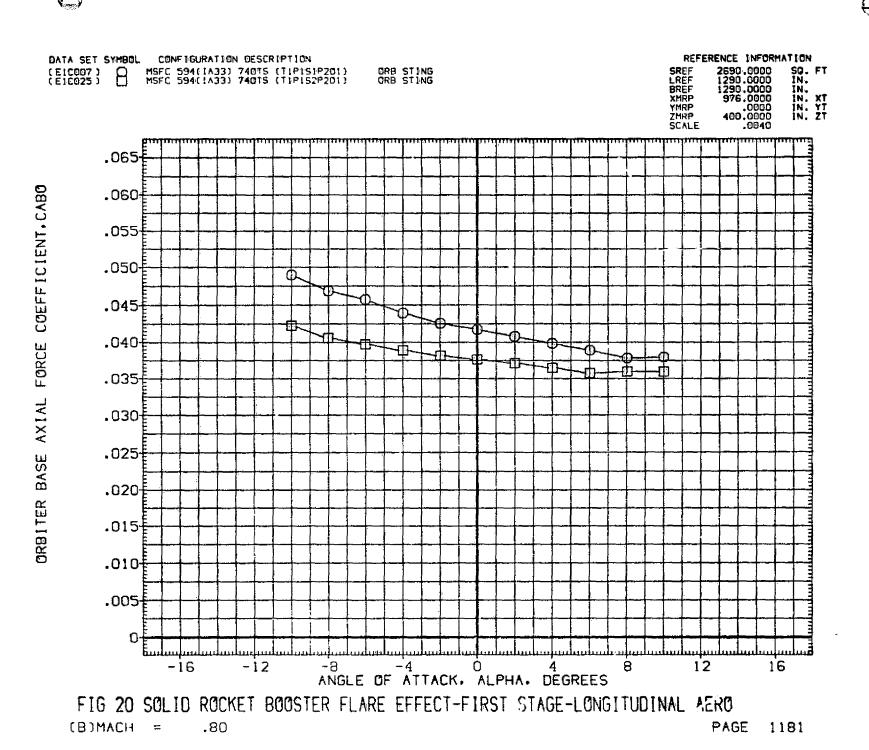
(I)MACH = 4.96

PAGE 1179

FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(A)MACH = .60

PAGE 1180



Control of the Contro

(C)MACH = .90 PAGE 1182

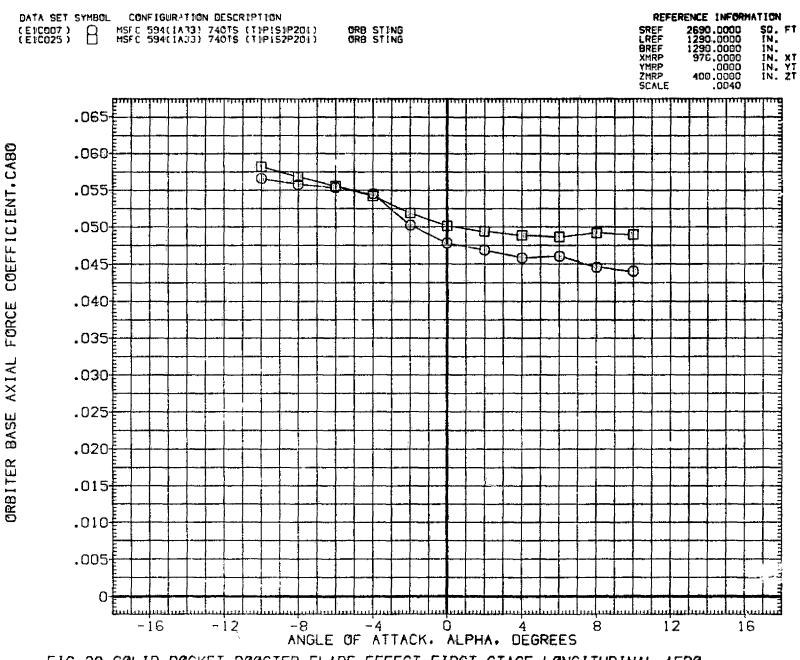


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(D)MACH = 1.10

PAGE 1183

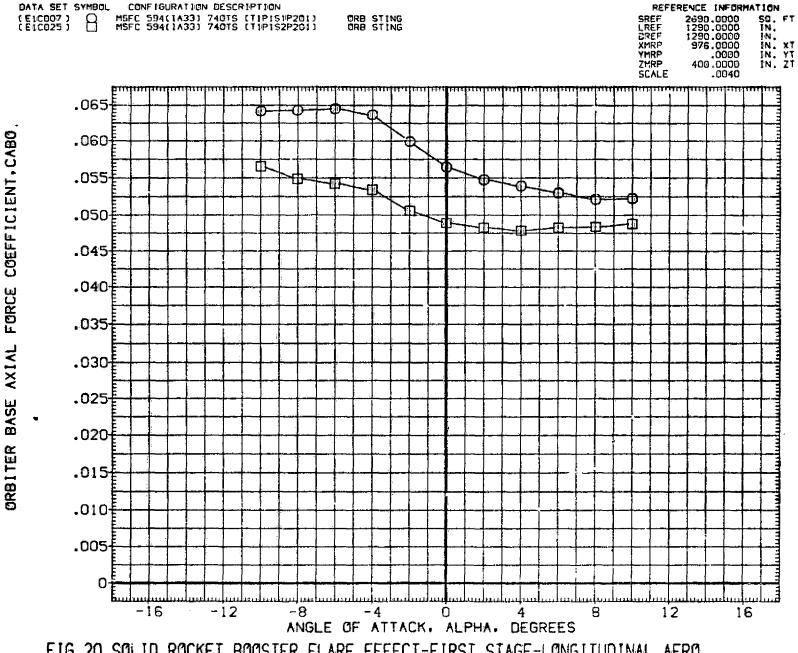


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

[E]MACH = 1.25

PAGE 1184

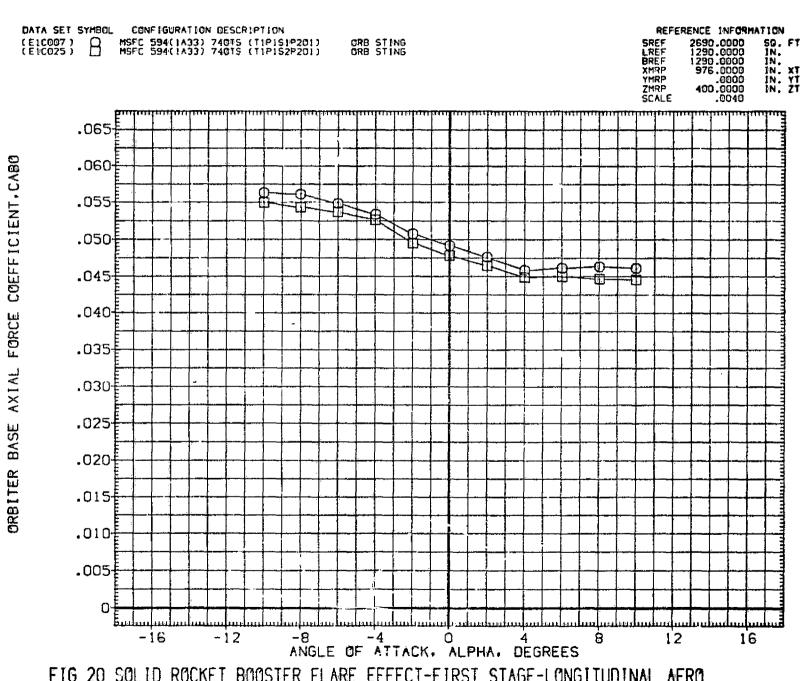


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(F)MACH =

FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(C)MACH = 1.96

PAGE 1186

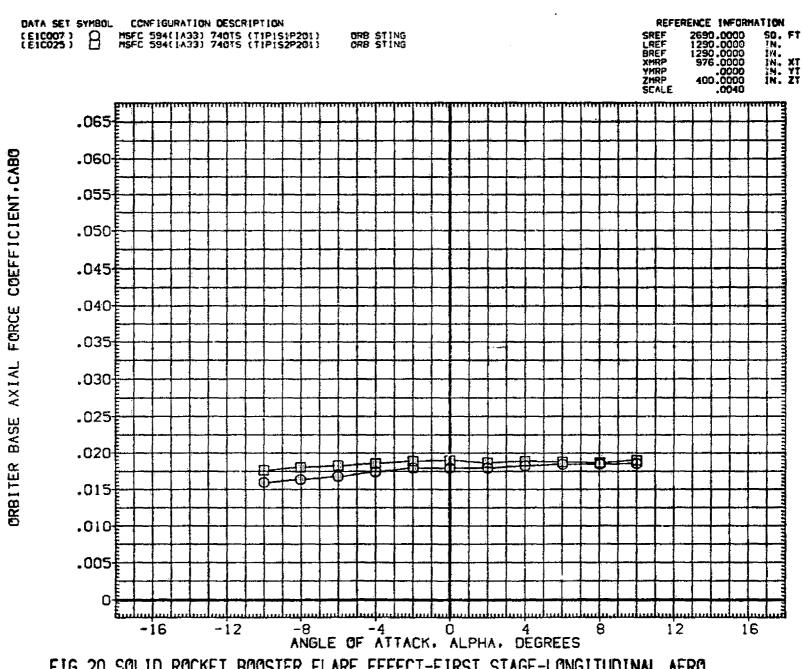


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(H)MACH = 2.99

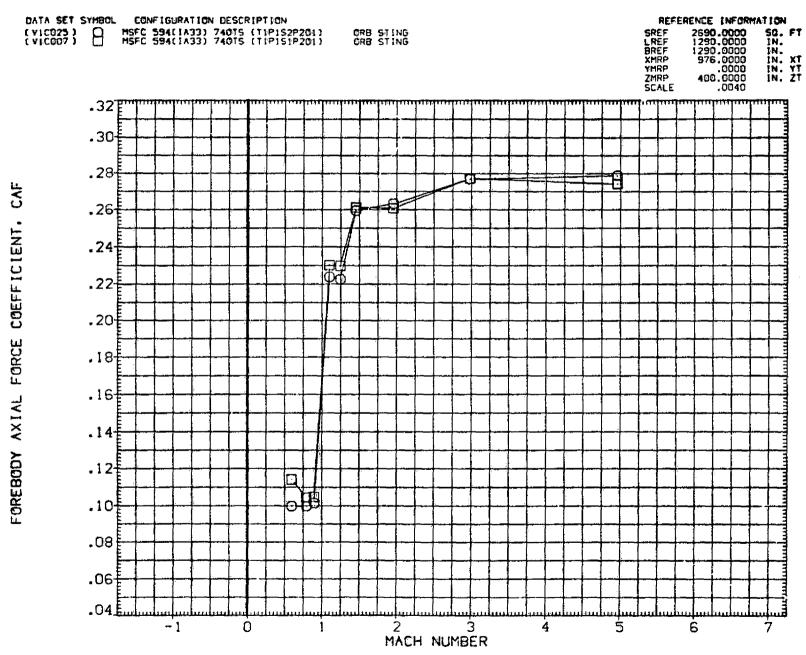


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(A)ALPHA = -10.00

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5-45 ·

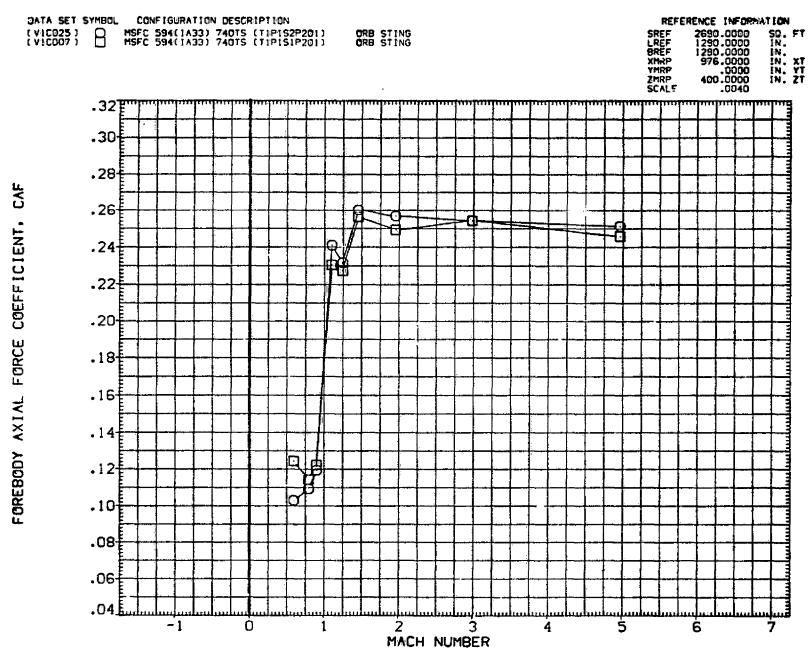
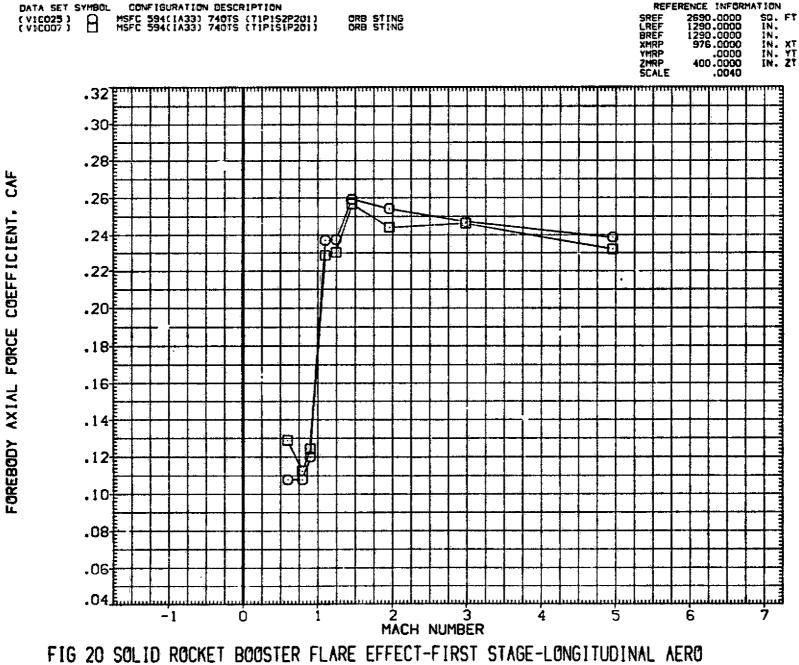


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(C)ALPHA = -6.00



(D)ALPHA = -4.00PAGE 1192

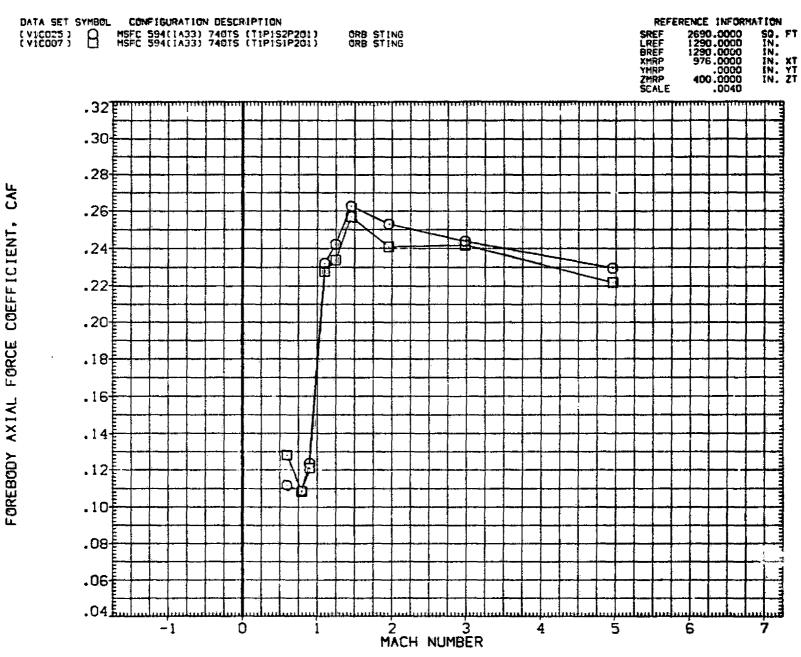


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(E) ALPHA = -2.00 PAGE

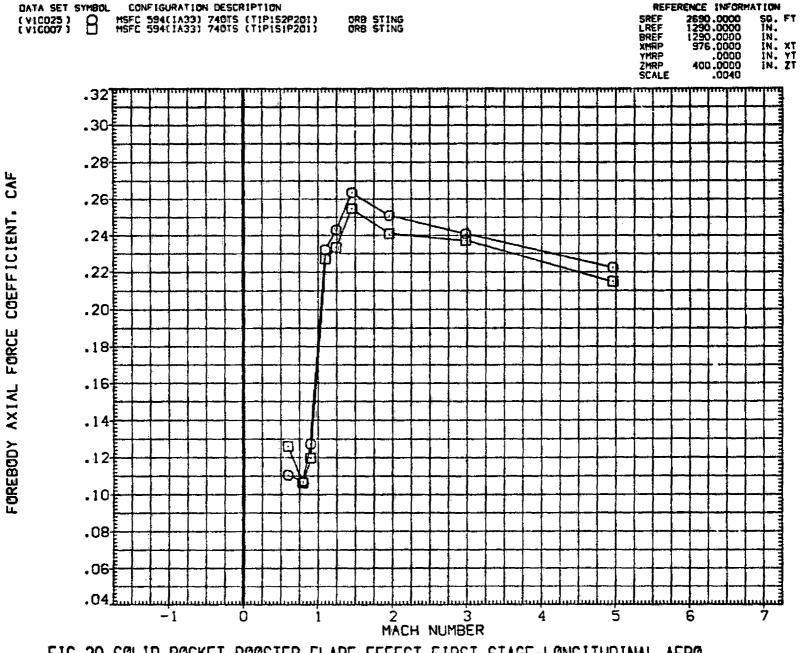


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(F)ALPHA = .00 PAGE 1194

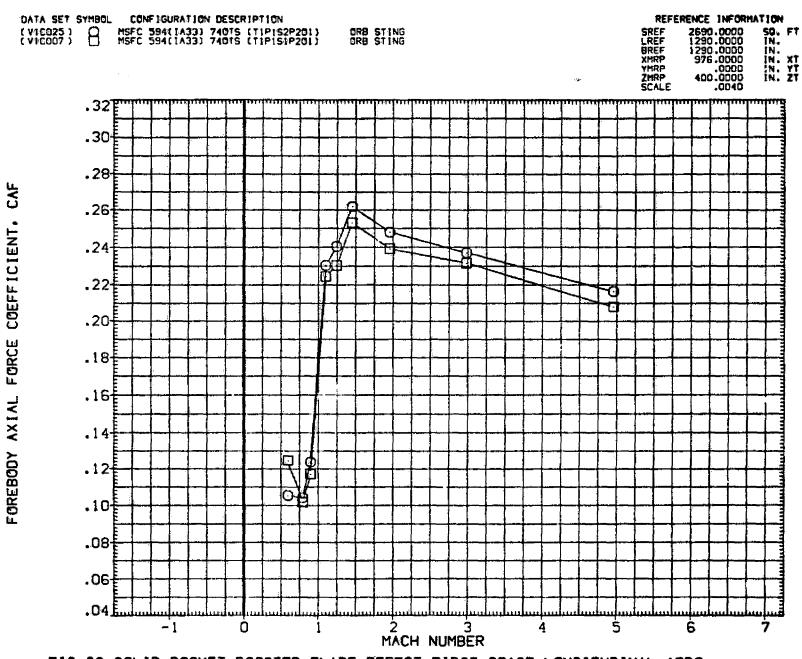
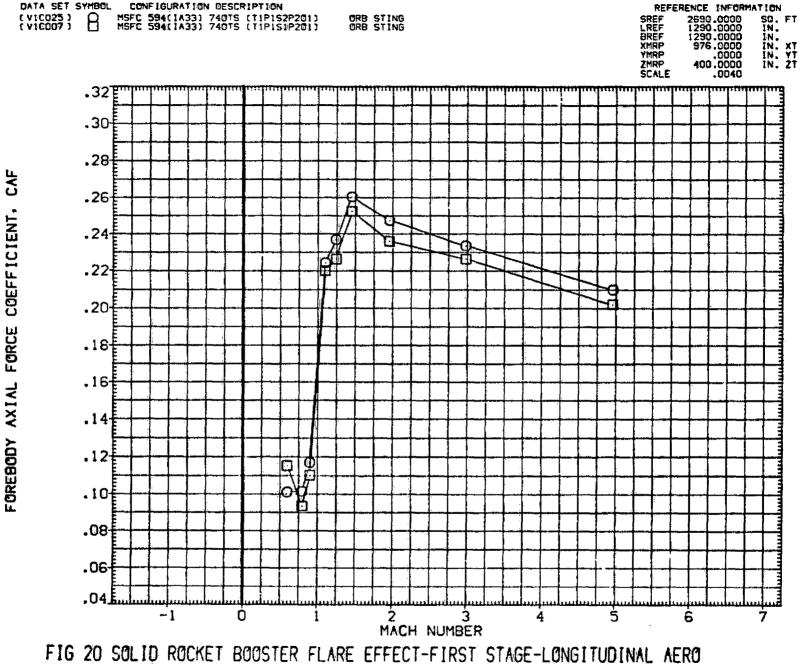


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(G)ALPHA = 2.00



(H)ALPHA = 4.00 PAGE 1196

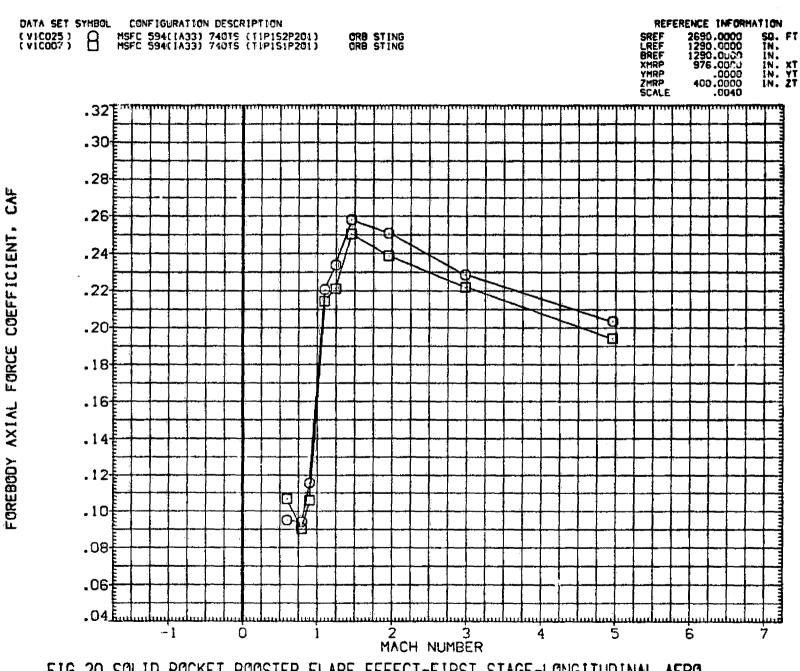


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

[1] ALPHA = 6.00 PAGE 1197

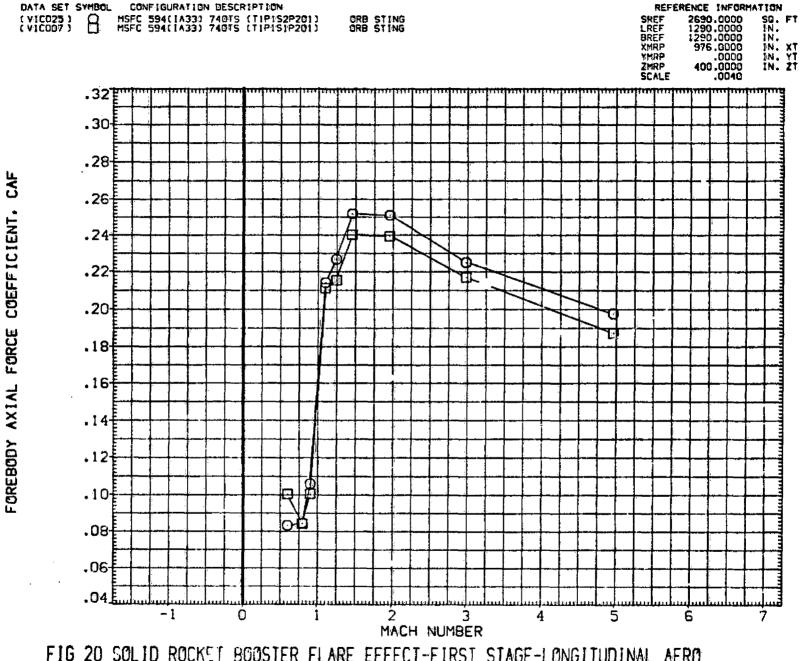
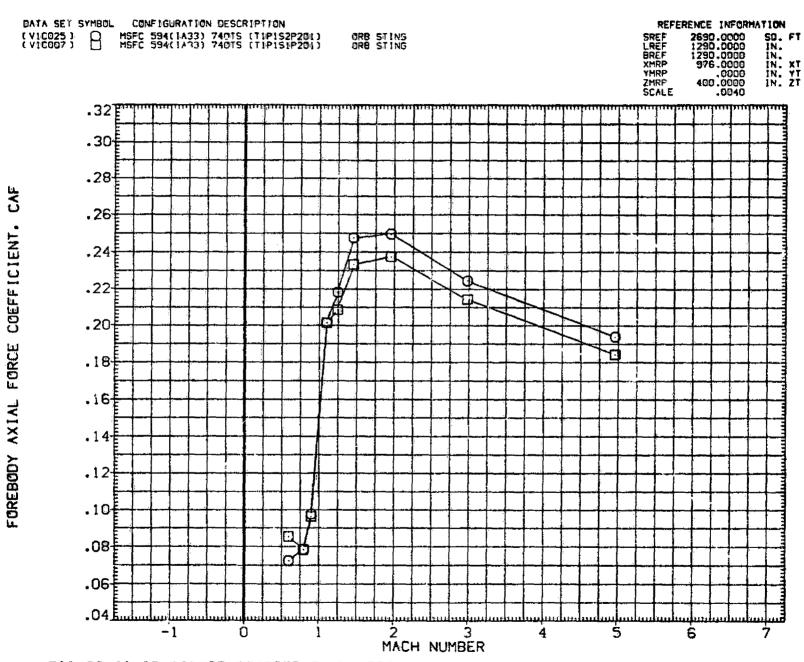


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(J)ALPHA = 8.00 PAGE 1198



(根據權利화학의 문학학의 시민 전환의 기원 기계학교 이 수 있는 사람들의 기원과 회사 기계학 기원 기계학에 되었다.

FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(K)ALPHA = 10.00

PAGE 1199

2. 1911年1日 1911年 191

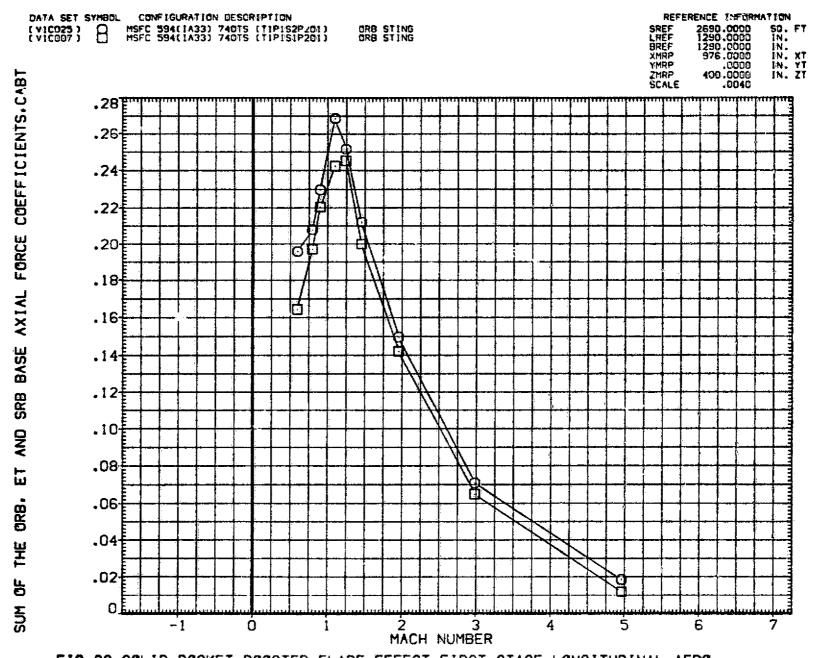


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

[A]ALPHA = -10.00 PAGE 1200

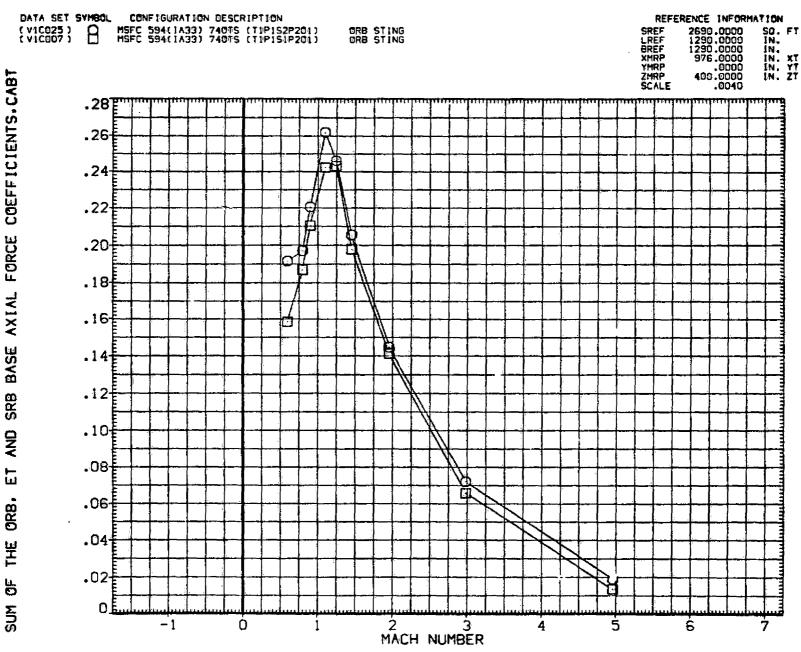


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(B) ALPHA = -8.00 PAGE 1201



FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(C)ALPHA = -6.00

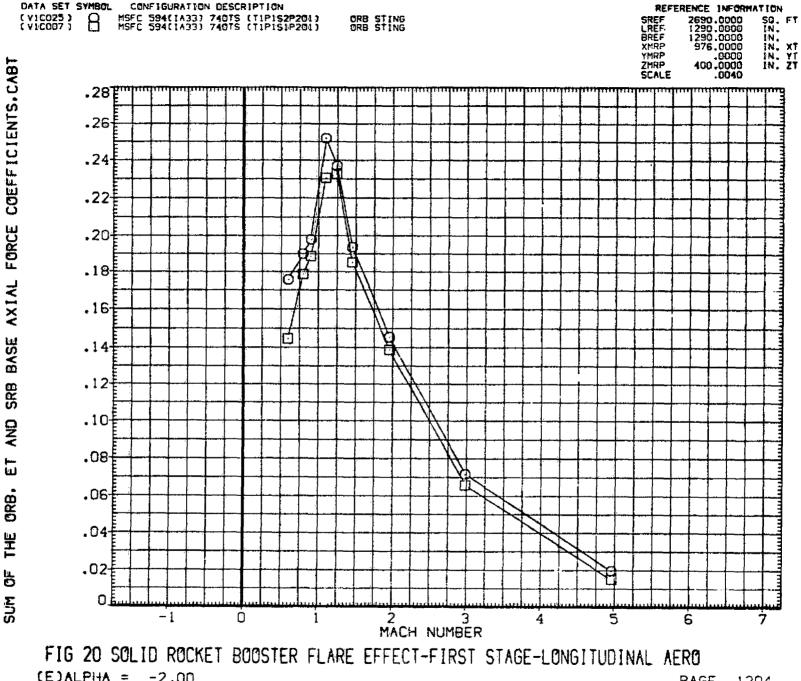
PAGE 1202



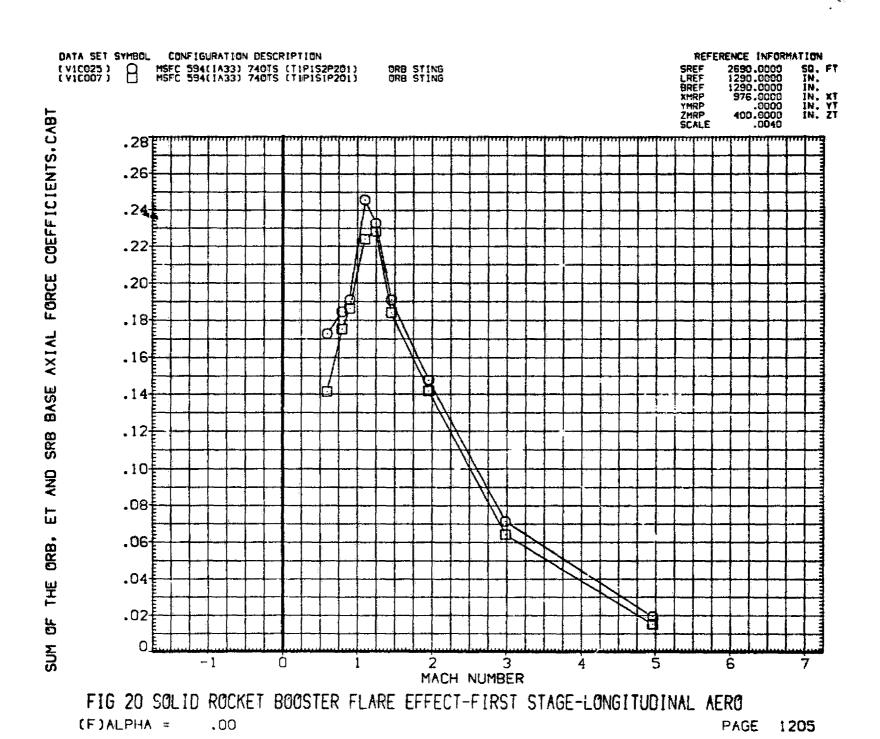
FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(D)ALPHA = -4.00

PAGE 1203



(E)ALPHA = -2.00PAGE 1204



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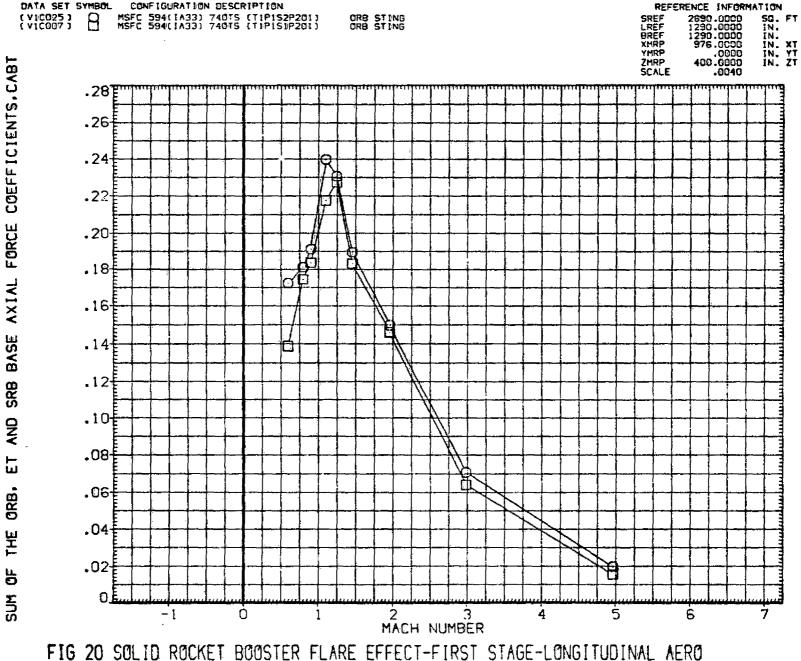


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(G)ALPHA = 2.00 PAGE 1206

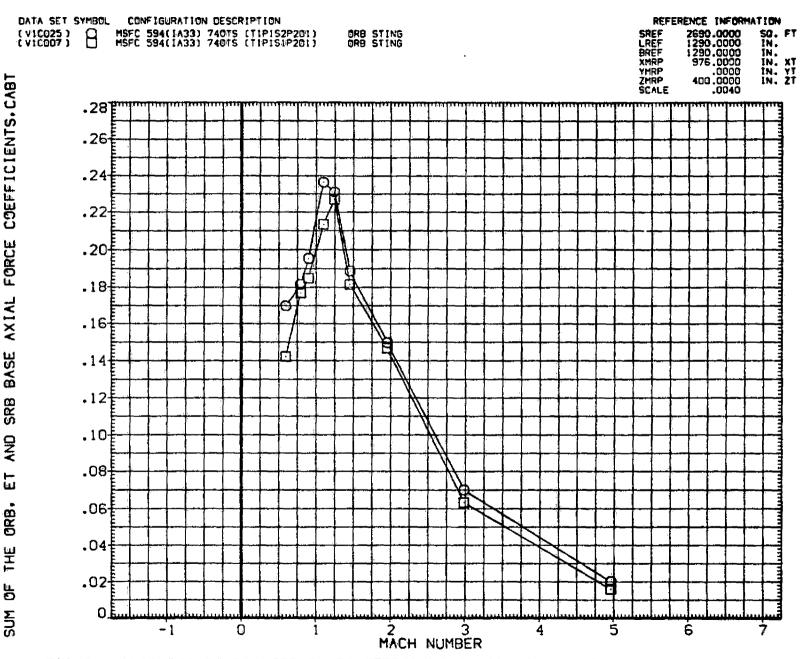
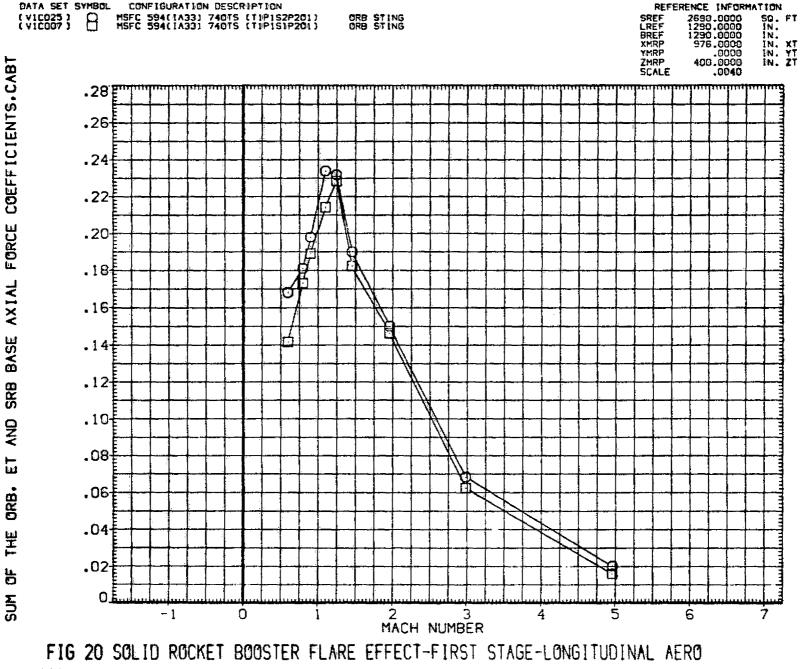


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(H)ALPHA = 4.00 PAGE 1207



(1)ALPHA = 6.00 PAGE 1208

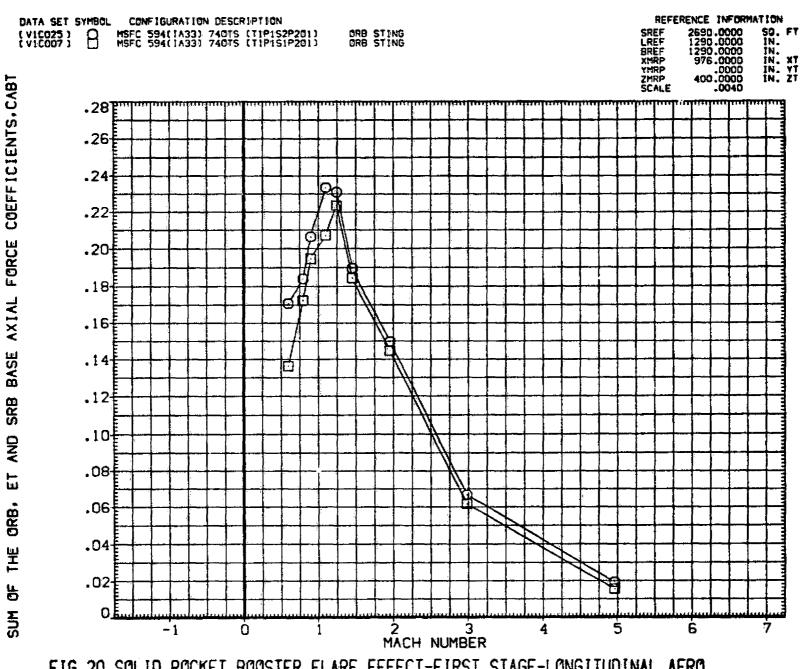


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(J)ALPHA = 8.00 PAGE 1209

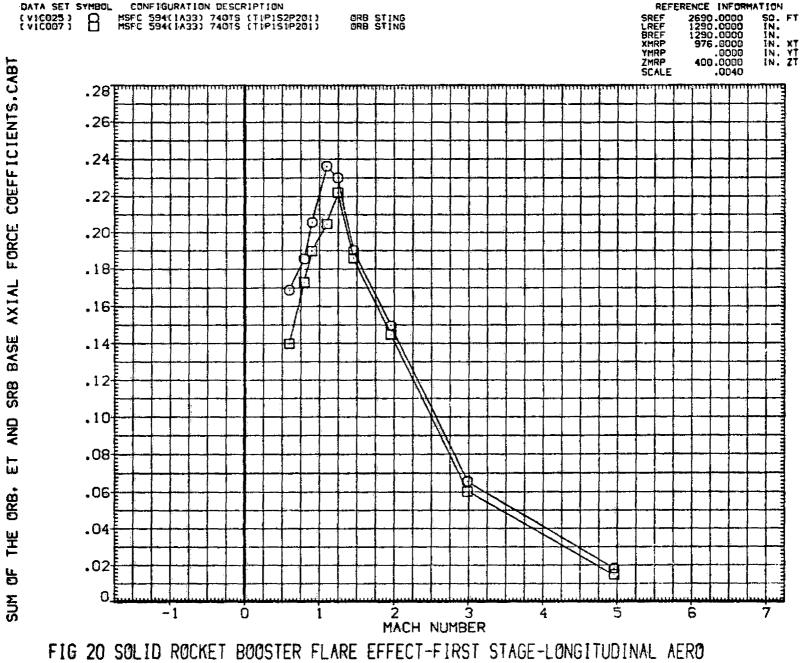


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(K)ALPHA = 10.00 PAGE 1210

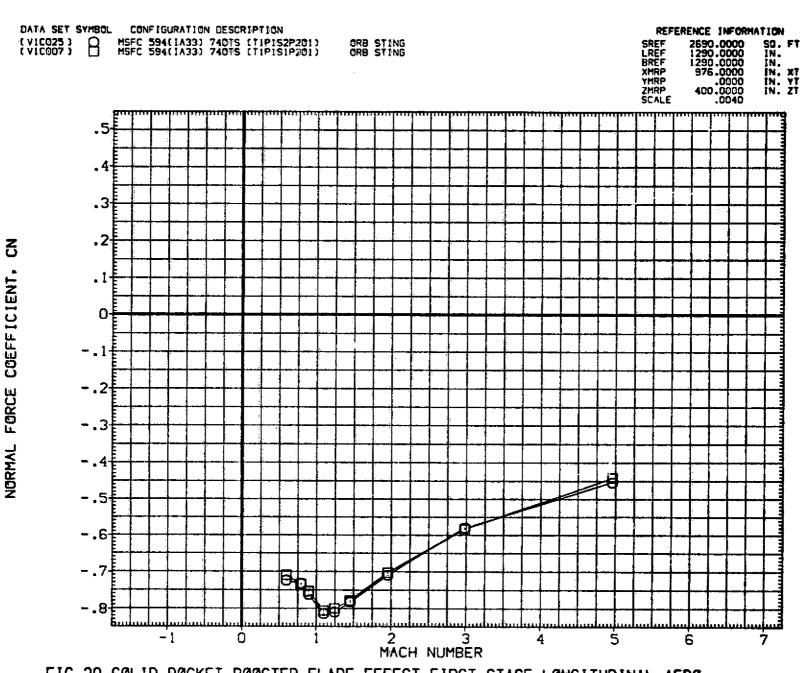
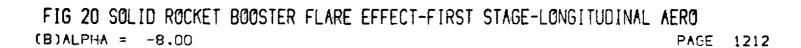


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

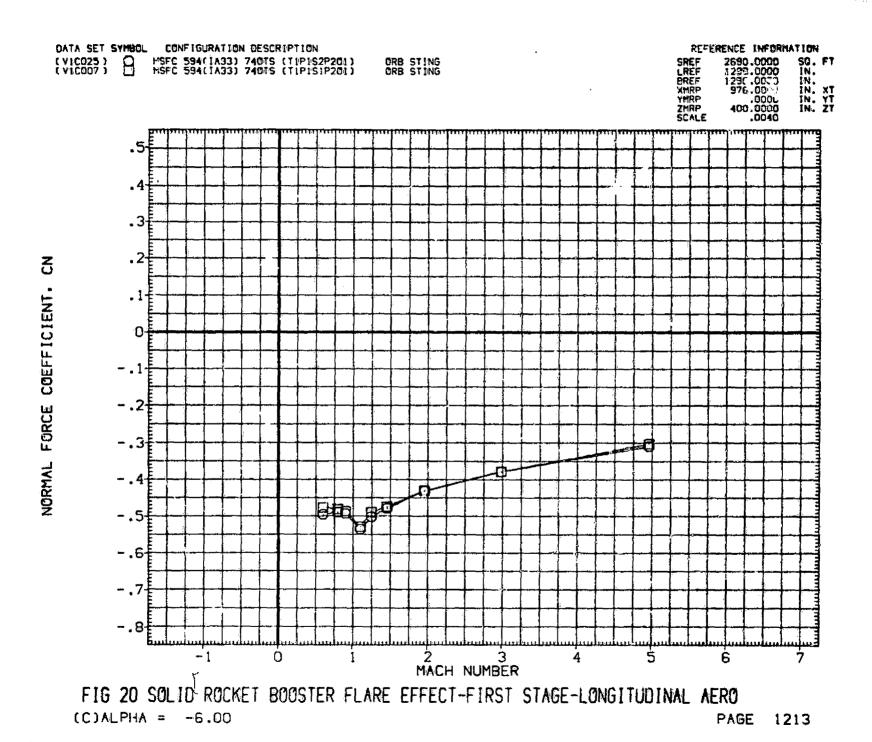
[A]ALPHA = -10.00 PAGE 1211

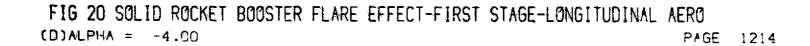


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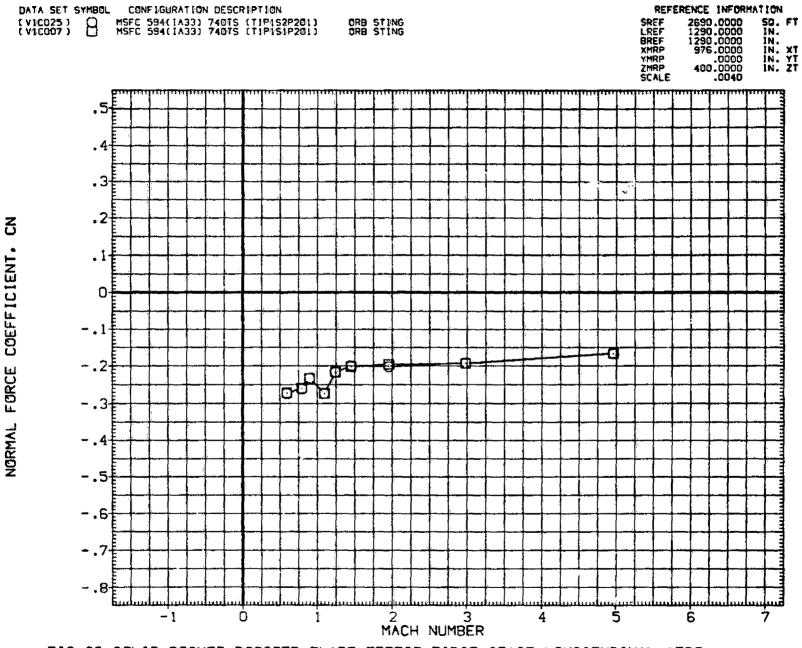


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(E)ALPHA = -2.00

PAGE 1215

FIG 20 SOLID ROCKET BOOCTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO (F)ALPHA =.00 PAGE 1216

MACH NUMBER

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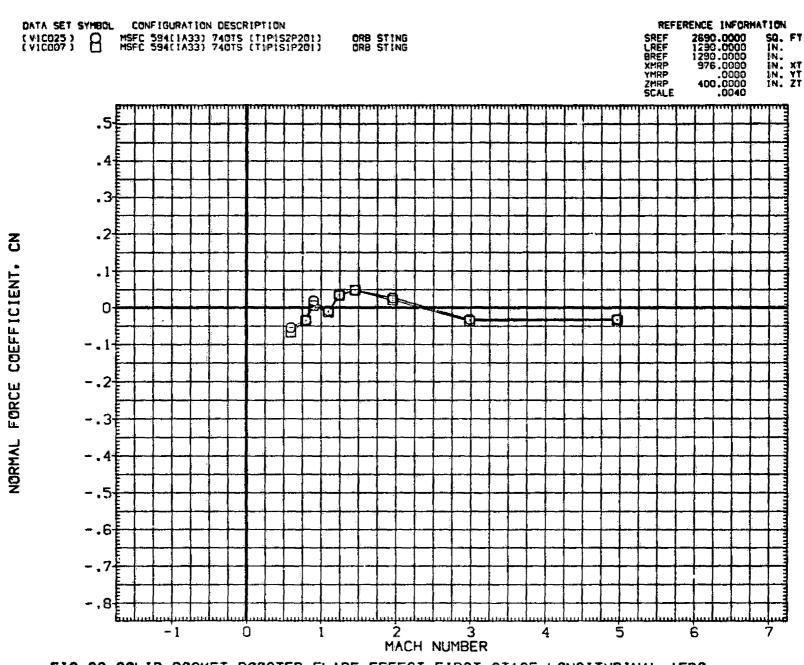
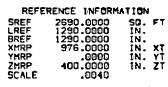


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(G)ALPHA = 2.00 PAGE 1217

NORMAL FORCE COEFFICIENT,



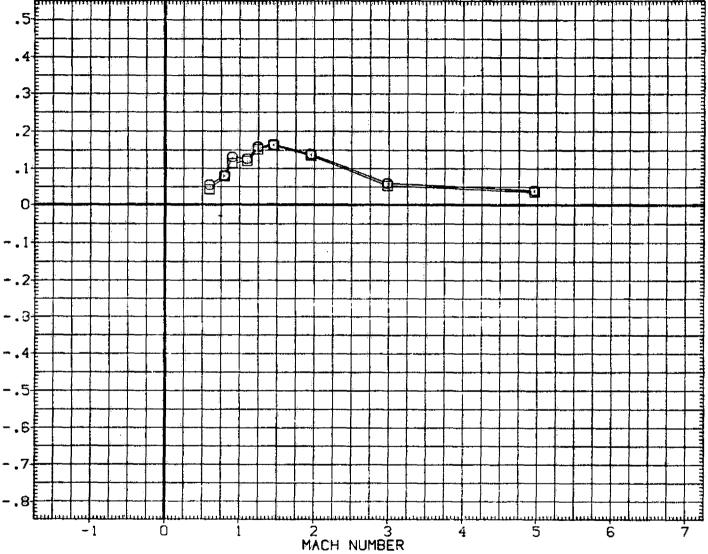


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(H)ALPHA = 4.00

PAGE 1218



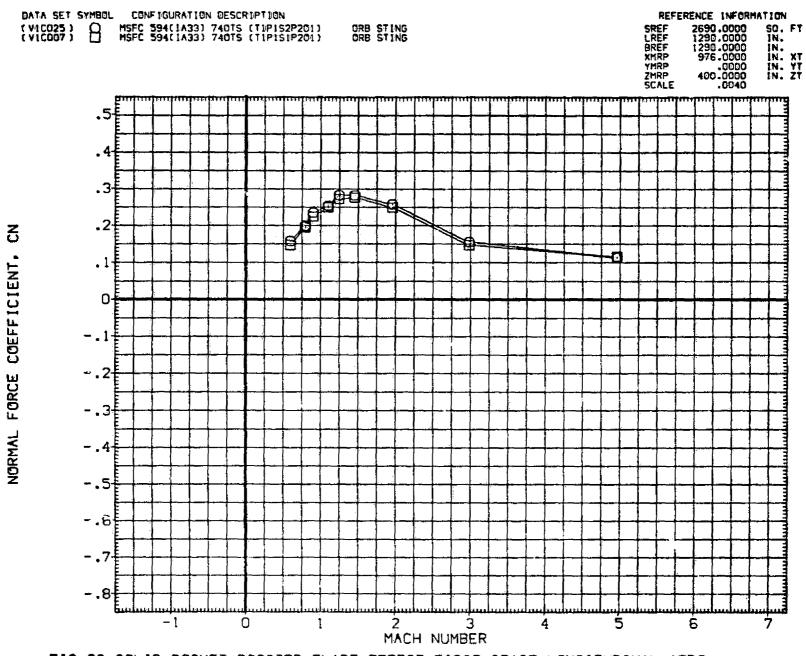


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(1) ALPHA = 6.00 PAGE 1219

FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(J)ALPHA = 8.00

PAGE 1220

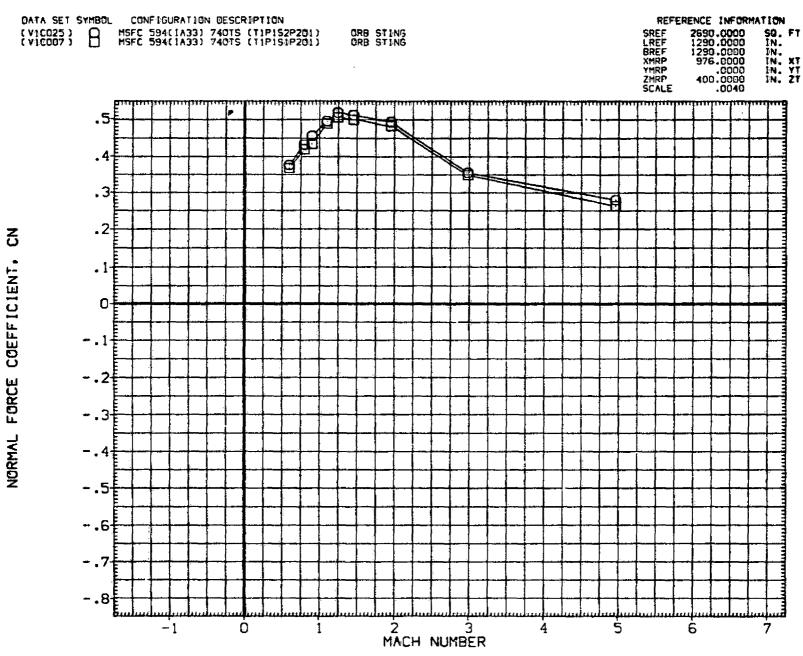


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(K)ALPHA = 10.00 PAGE 1221

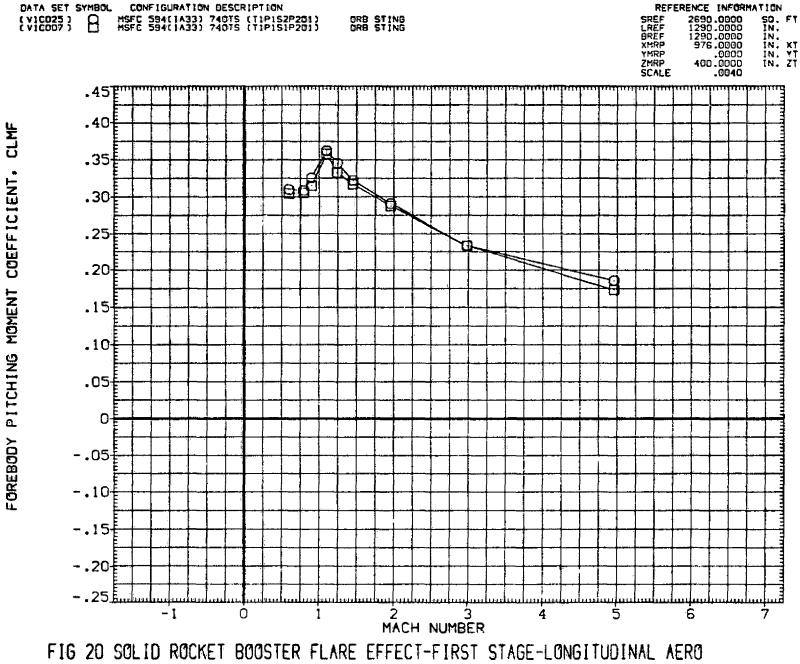


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(A)ALPHA = -10.00

PAGE 1222

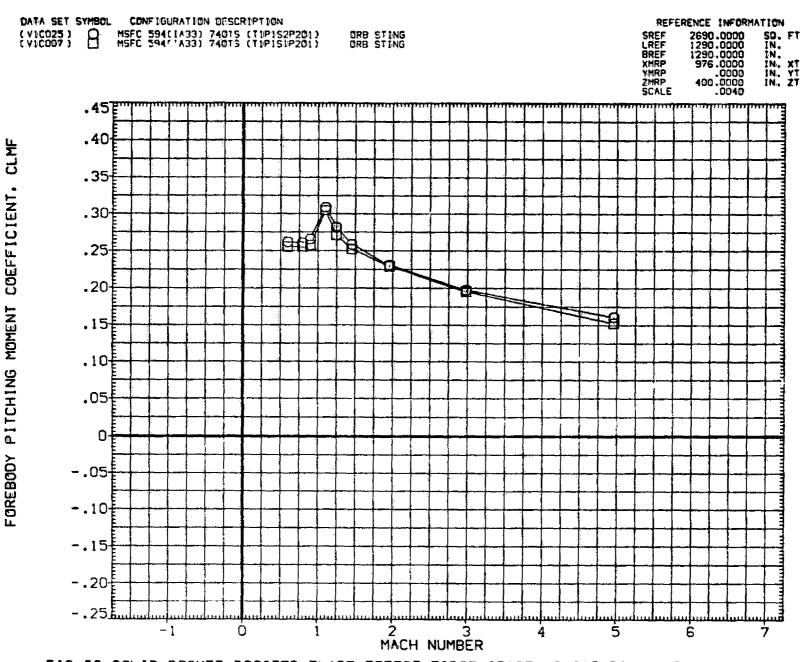
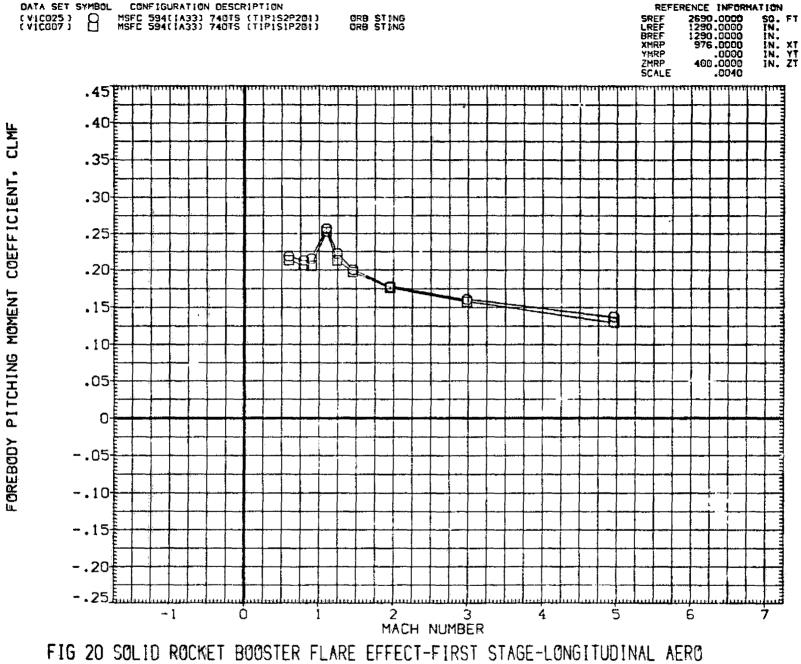
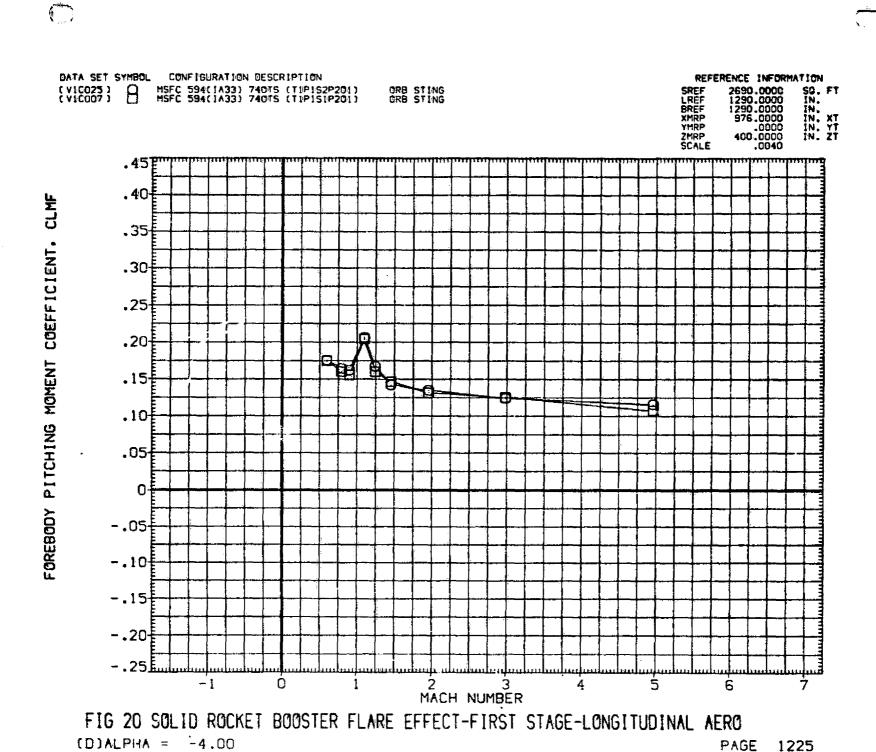


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(B)ALPHA = -8.00 PAGE 1223



(C)ALPHA = -6.00PAGE 1224



。我们就是我们就是我们就是我们的,我们就是我们的,我们就是一个人的,我们就是一个人的,我们就是一个人的,我们就会看到这个人的,我们就是我们的,我们也没有一个人的

FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(E)ALPHA = -2.00

PAGE 1226

CONFIGURATION DESCRIPTION REFERENCE INFORMATION 2690.0000 1290.0000 1290.0000 976.0000 400.0000 .0040 SQ. FT IN. IN. IN. XT IN. YT IN. ZT MSFC 594(1A33) 740TS (T1P1S2P201) MSFC 594(1A33) 740TS (T1P1S1P201) ORB STING LRE# BREF XMRP YMRP ZMRP SCALE .45T .40 .35 COEFFICIENT. .30 .25 .20 PITCHING MOMENT .15 .10+ .05 0 -.05

-.10<del>[</del>

-.15

-.20<del>[</del>

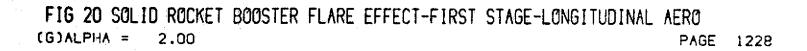
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FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(F)ALPHA = .00 PAGE 1227

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MACH NUMBER

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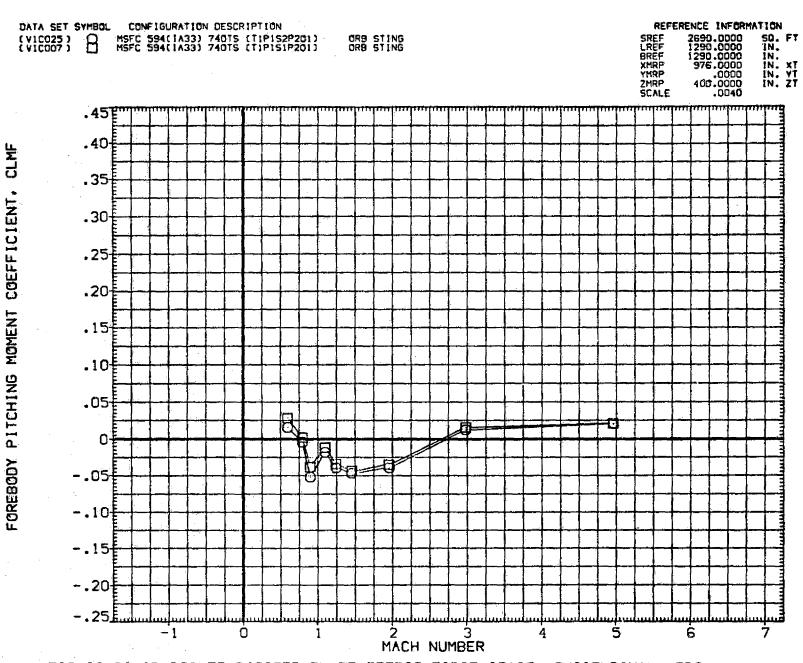
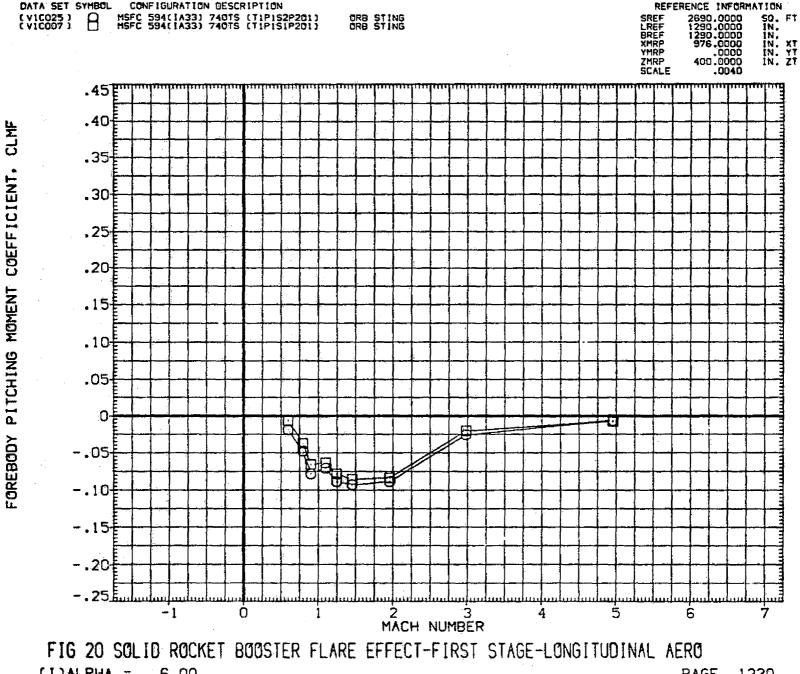


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(H)ALPHA = 4.00 PAGE 1229



CIDALPHA = 6.00 PAGE 1230

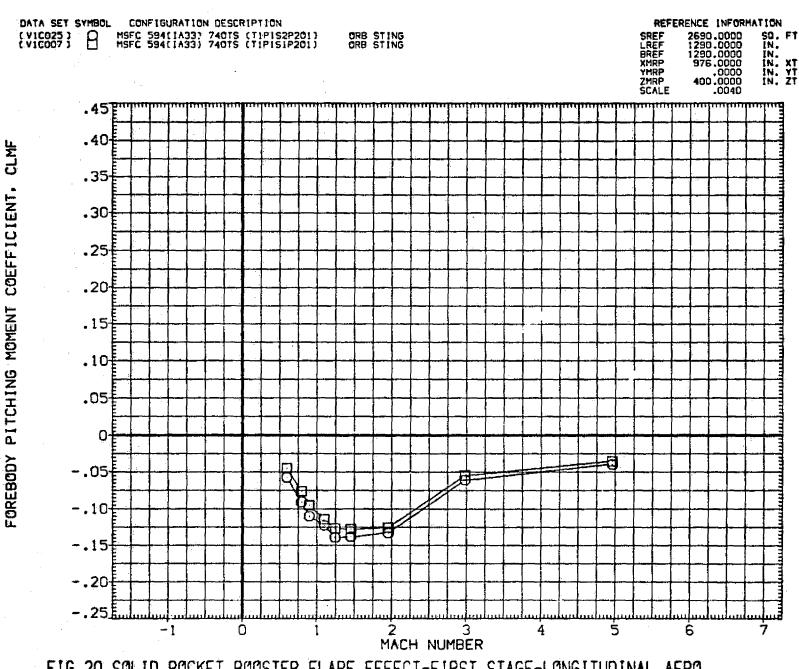


FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(J)ALPHA = 8.00 PAGE 1231

FIG 20 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LONGITUDINAL AERO

(K)ALPHA = 10.00 PAGE 1232

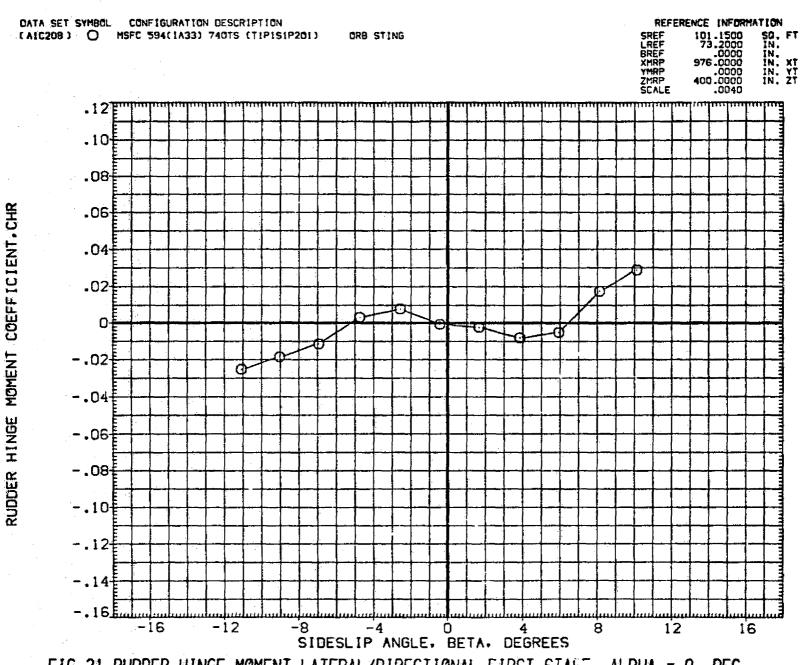


FIG 21 RUDDER HINGE MOMENT-LATERAL/DIRECTIONAL-FIRST STAGE. ALPHA = 0 DEG

(A)MACH = .80

PAGE 1233

(B)MACH = .80PAGE 1234

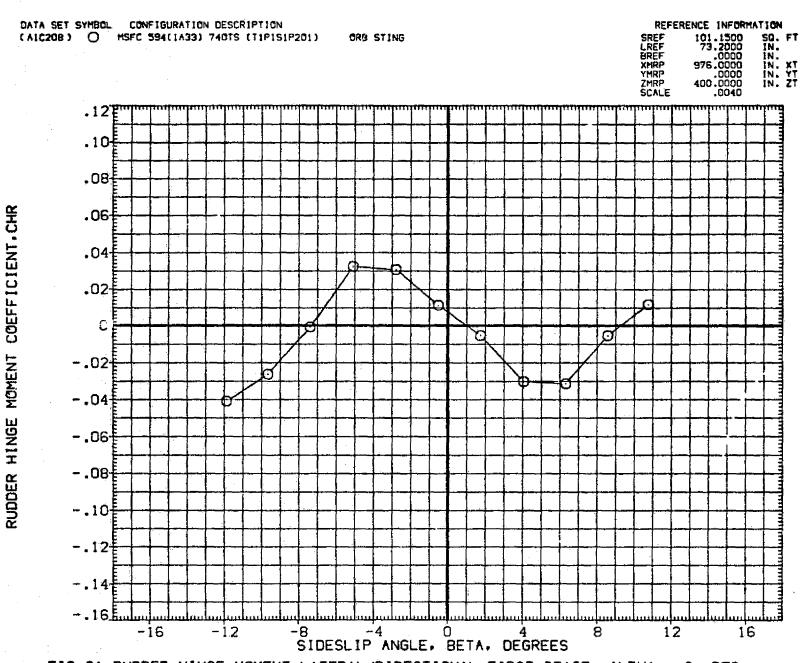


FIG 21 RUDDER HINGE MOMENT-LATERAL/DIRECTIONAL-FIRST STAGE, ALPHA = 0 DEG

(C)MACH = .90

PAGE 1235

FIG 21 RUDDER HINGE MOMENT-LATERAL/DIRECTIONAL-FIRST STAGE, ALPHA = 0 DEG

(D)MACH = 1.05

PAGE 1236

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-16

-12

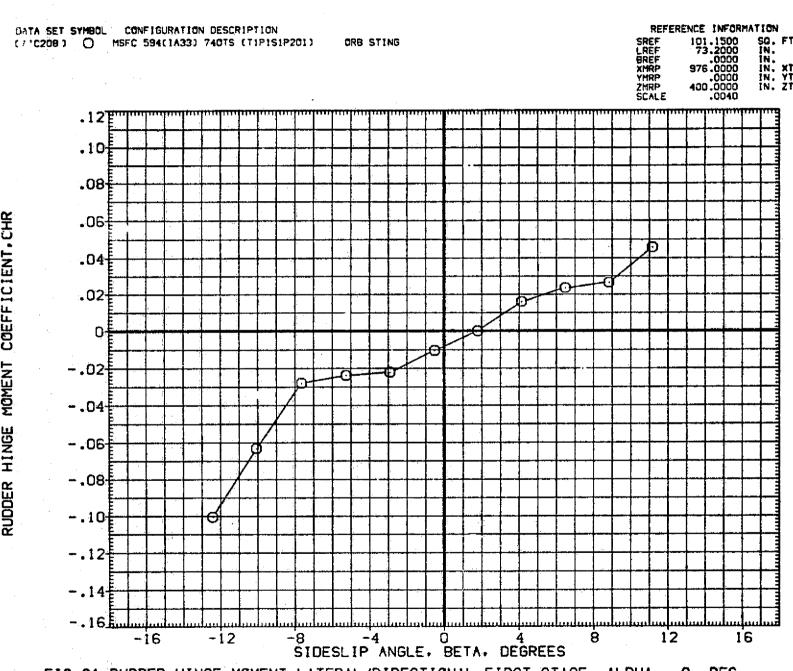


FIG 21 RUDDER HINGE MOMENT-LATERAL/DIRECTIONAL-FIRST STAGE, ALPHA = 0 DEG

(E)MACH = 1.10

PAGE 1237

FIG 21 RUDDER HINGE MOMENT-LATERAL/DIRECTIONAL-FIRST STAGE, ALPHA = 0 DEG

(F)MACH = 1.25

PAGE 1238

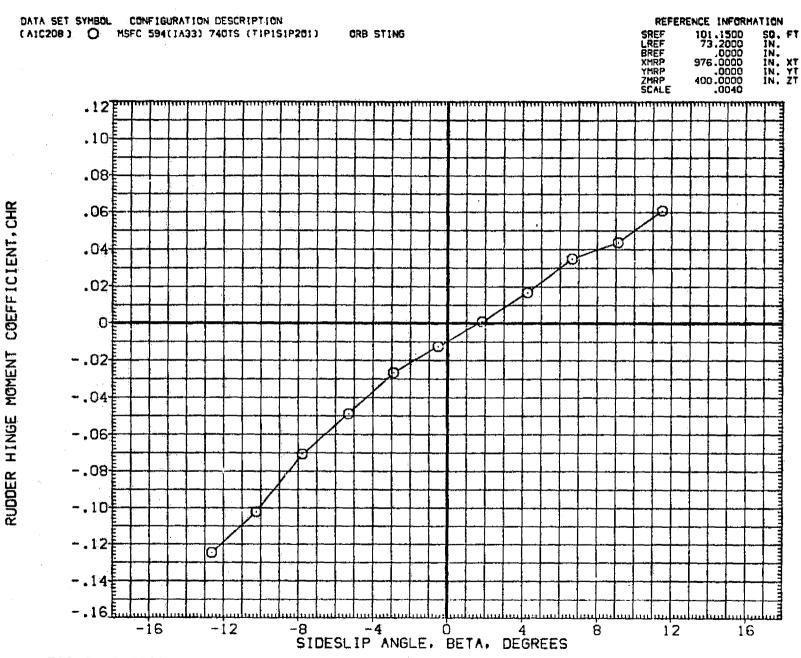
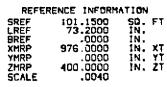


FIG 21 RUDDER HINGE MOMENT-LATERAL/DIRECTIONAL-FIRST STAGE, ALPHA = 0 DEG

(G)MACH = 1.47

PAGE 1239



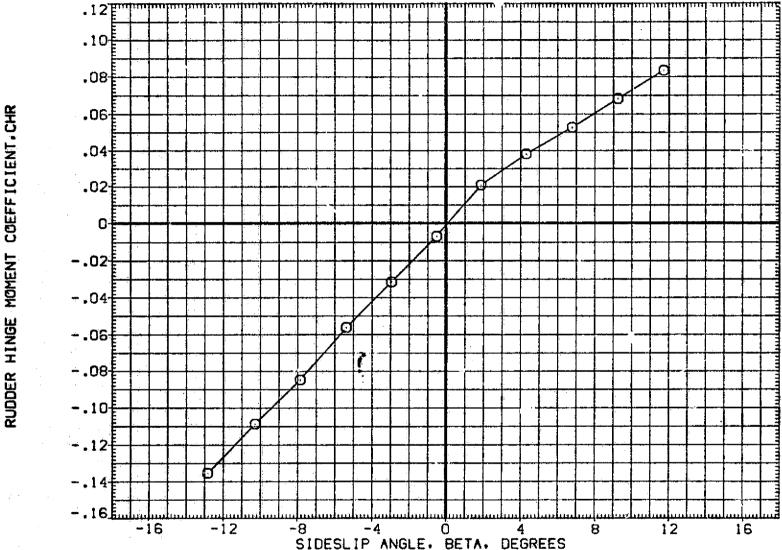


FIG 21 RUDDER HINGE MOMENT-LATERAL/DIRECTIONAL-FIRST STAGE, ALPHA = 0 DEG

(H)MACH = 1.97

PAGE 1240

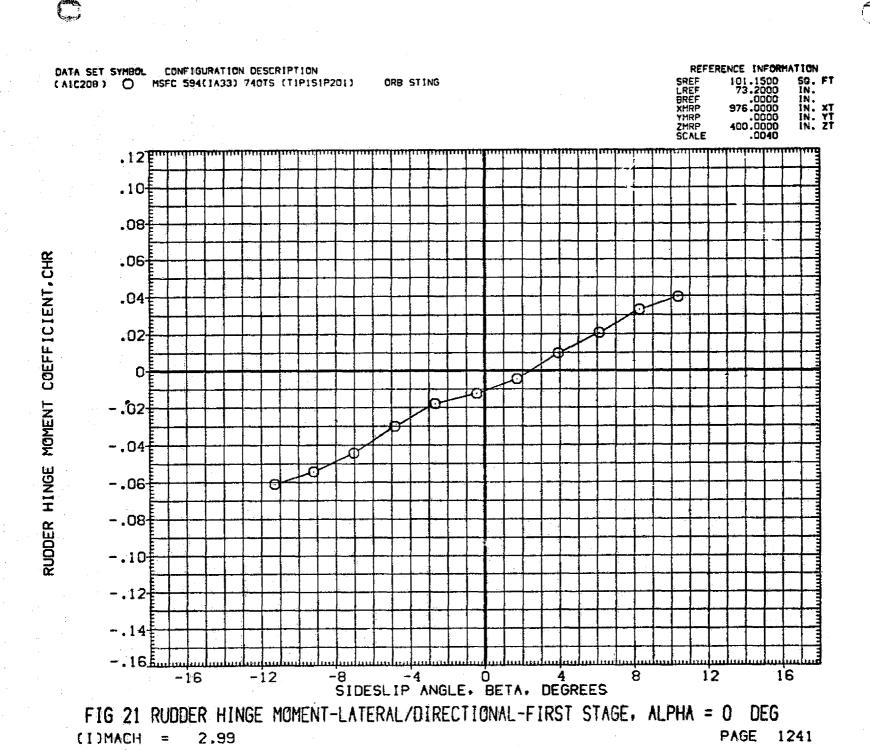
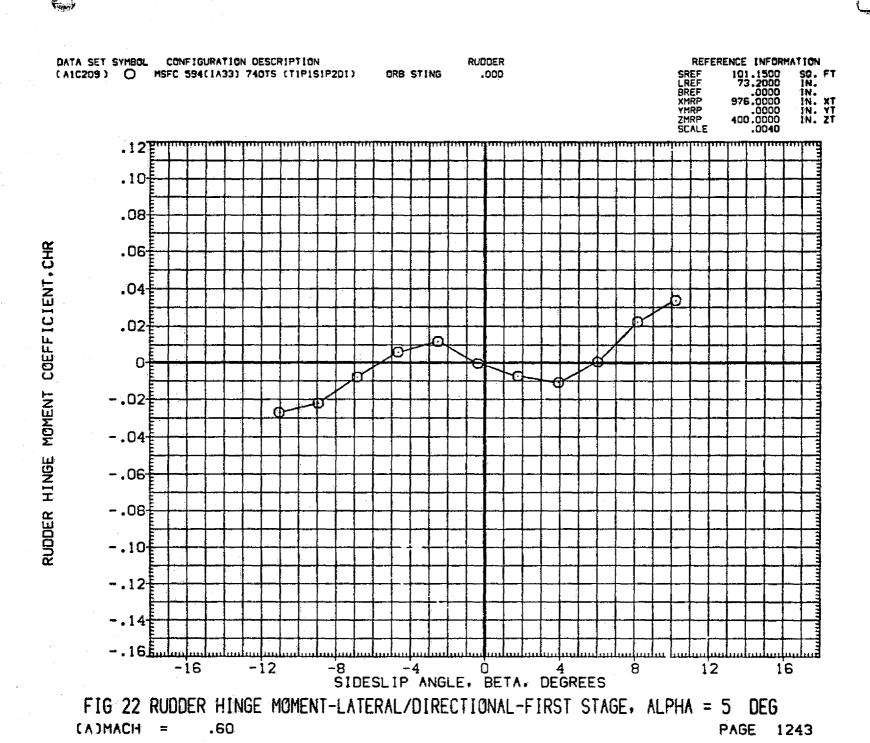
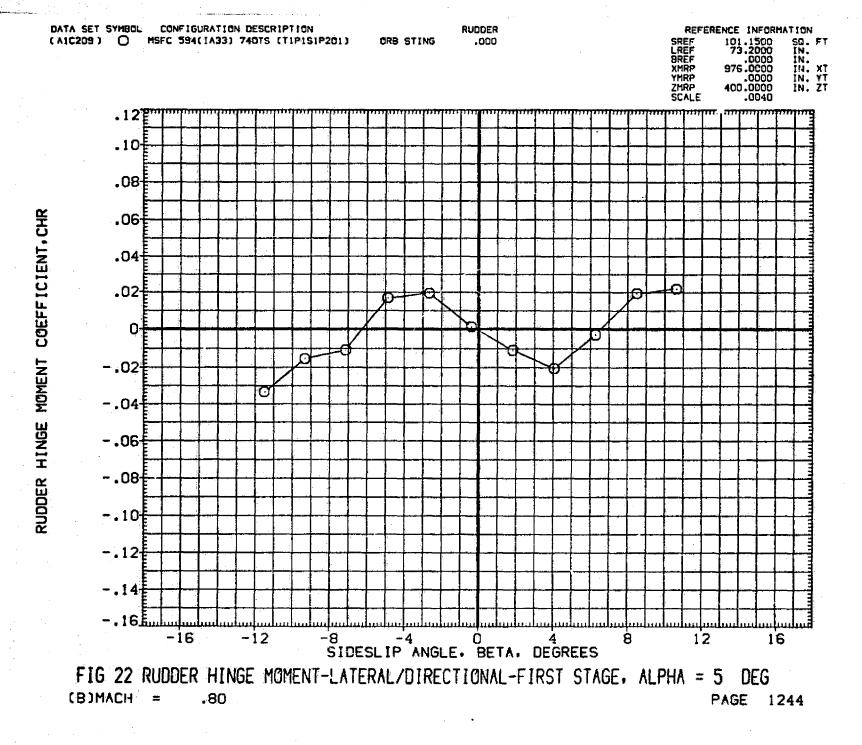


FIG 21 RUDDER HINGE MOMENT-LATERAL/DIRECTIONAL-FIRST STAGE, ALPHA = 0 DEG

[J]MACH = 4.96

PAGE 1242





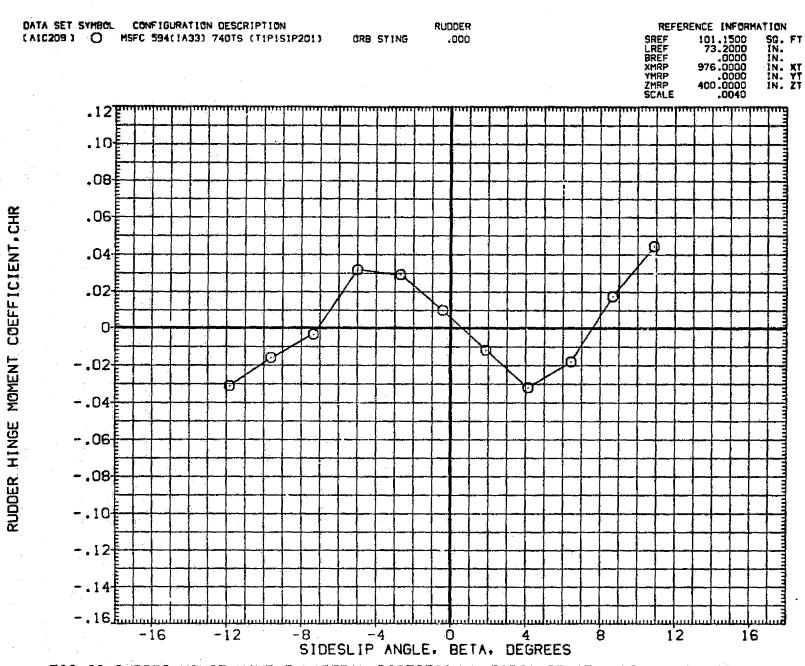


FIG 22 RUDDER HINGE MOMENT-LATERAL/DIRECTIONAL-FIRST STAGE, ALPHA = 5 DEG

(C)MACH = .91

PAGE 1245

(D)MACH = 1.10PAGE 1246

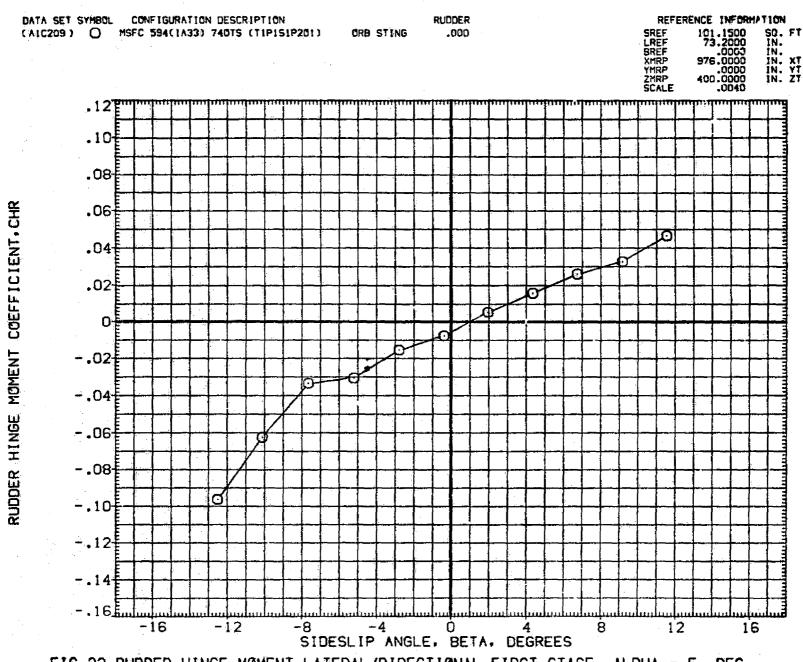


FIG 22 RUDDER HINGE MOMENT-LATERAL/DIRECTIONAL-FIRST STAGE, ALPHA = 5 DEG

(E)MACH = 1.25

PAGE 1247

(F)MACH = 1.46PAGE 1248

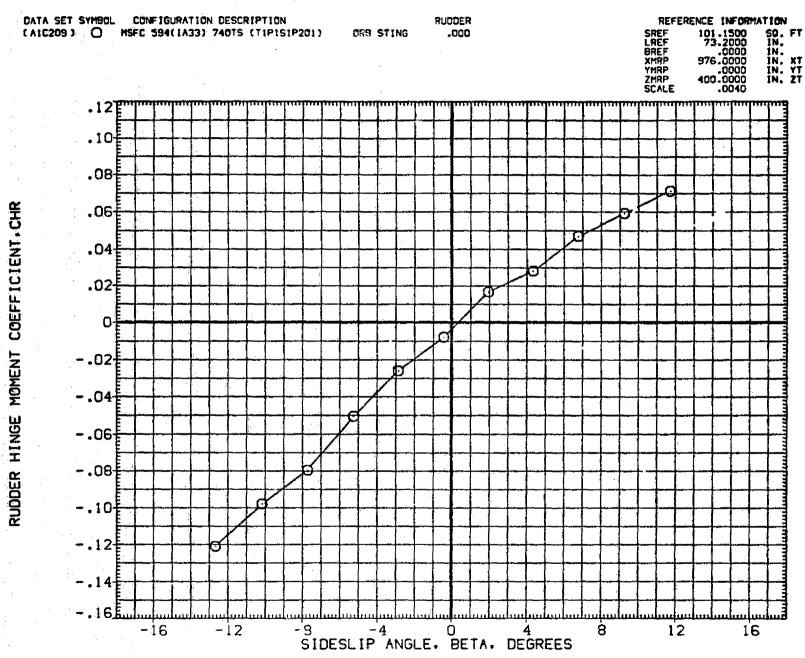


FIG 22 RUDDER HINGE MOMENT-LATERAL/DIRECTIONAL-FIRST STAGE, ALPHA = 5 DEG

(G)MACH = 1.96

PAGE 1249

CHOMACH = 2.99PAGE 1250

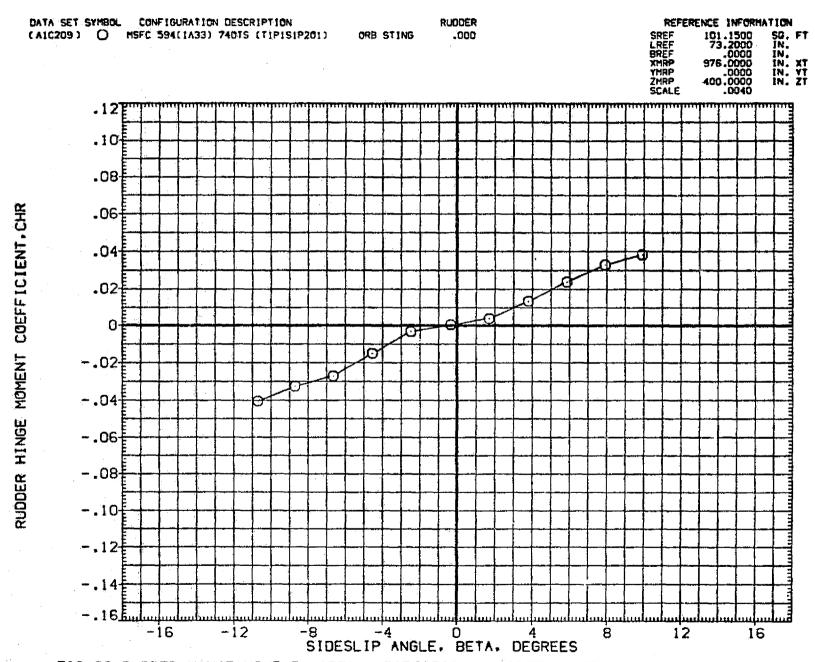
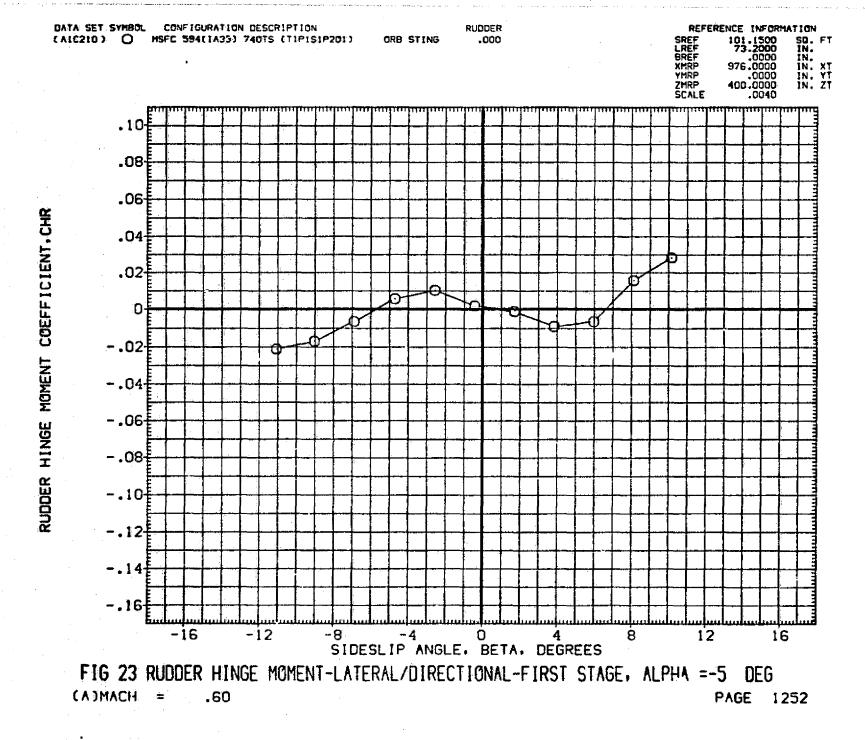


FIG 22 RUDDER HINGE MOMENT-LATERAL/DIRECTIONAL-FIRST STAGE, ALPHA = 5 DEG
(I)MACH = 4.96

PAGE 1251



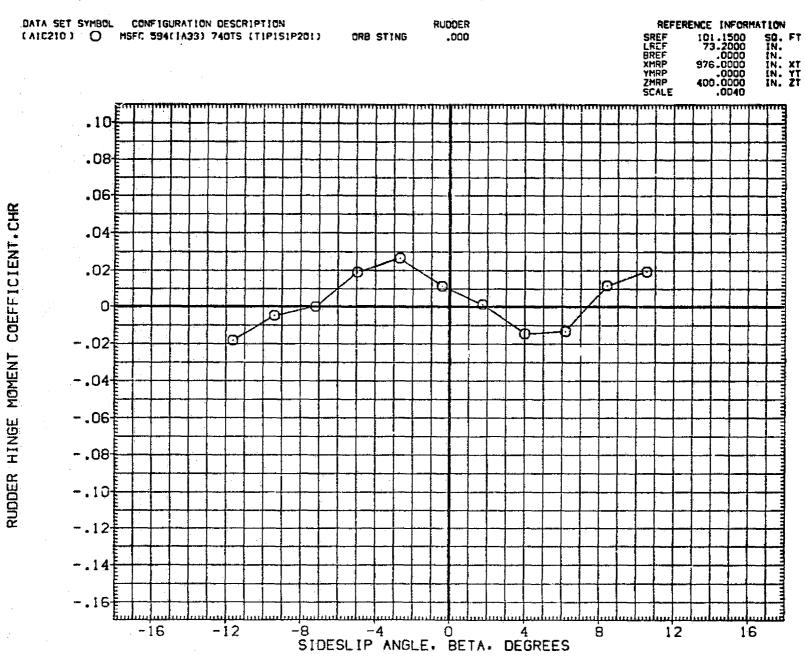


FIG 23 RUDDER HINGE MOMENT-LATERAL/DIRECTIONAL-FIRST STAGE, ALPHA =-5 DEG

CB. = HOAMCH = .80

PAGE 1253

(C)MACH = .90 PAGE 1254

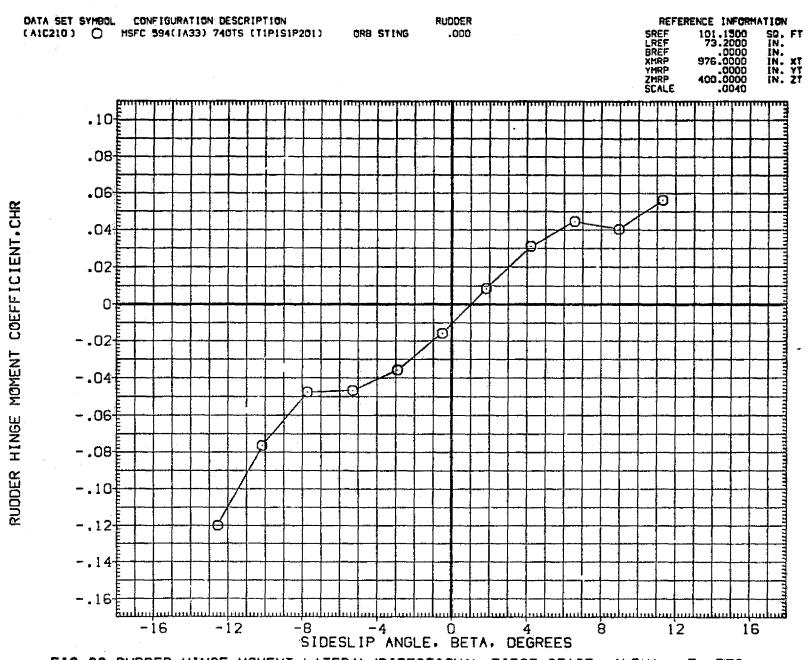


FIG 23 RUDDER HINGE MOMENT-LATERAL/DIRECTIONAL-FIRST STAGE, ALPHA =-5 DEG

(D)MACH = 1.10

PAGE 1255

The words of a conflict out to a course while whose histories of more provided a first being simple out being of

FIG 23 RUDDER HINGE MOMENT-LATERAL/DIRECTIONAL-FIRST STAGE, ALPHA =-5 DEG

(E)MACH = 1.25

PAGE 1256

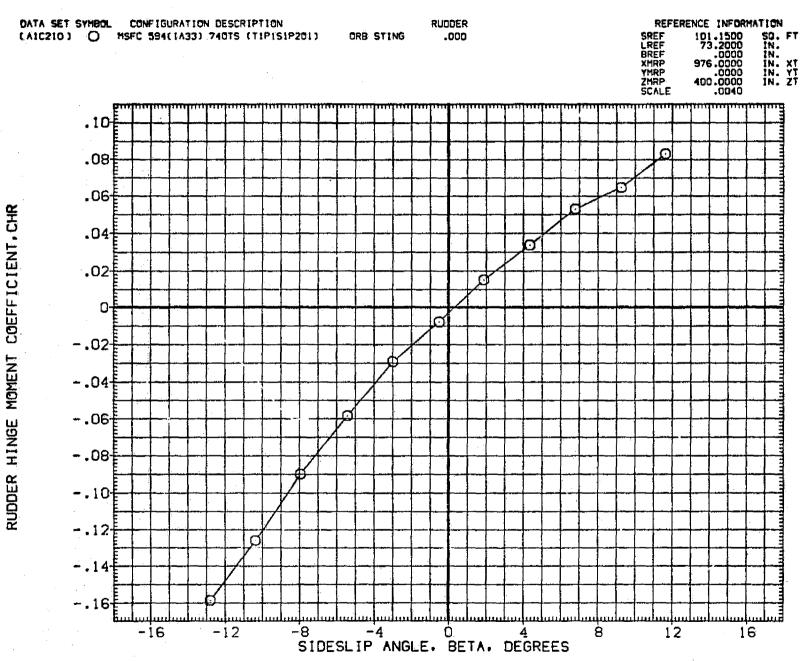


FIG 23 RUDDER HINGE MOMENT-LATERAL/DIRECTIONAL-FIRST STAGE, ALPHA =-5 DEG

(F)MACH = 1.46

PAGE 1257

(G)MACH = 1.97PAGE 1258

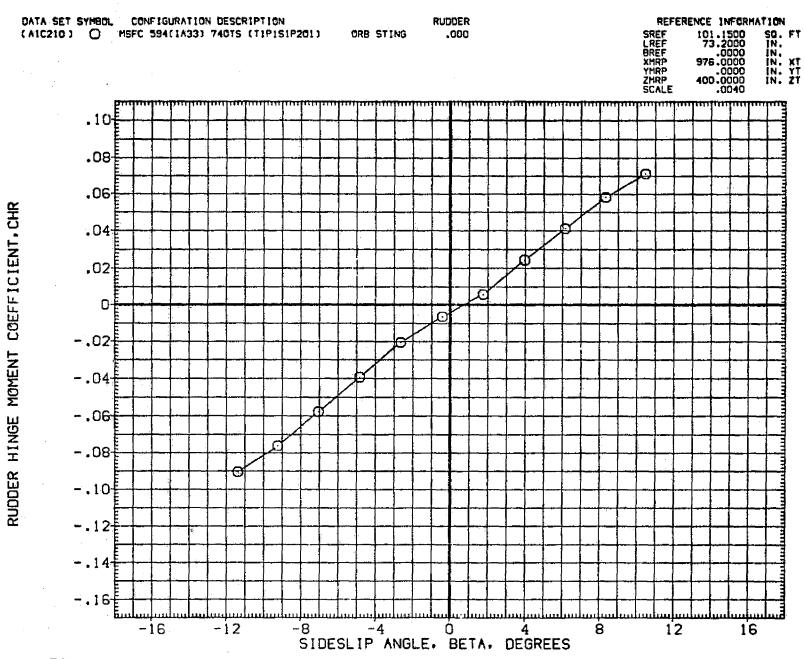


FIG 23 RUDDER HINGE MOMENT-LATERAL/DIRECTIONAL-FIRST STAGE, ALPHA =-5 DEG

CH)MACH = 2.99

PAGE 1259

(1)MACH = 4.96PAGE 1260

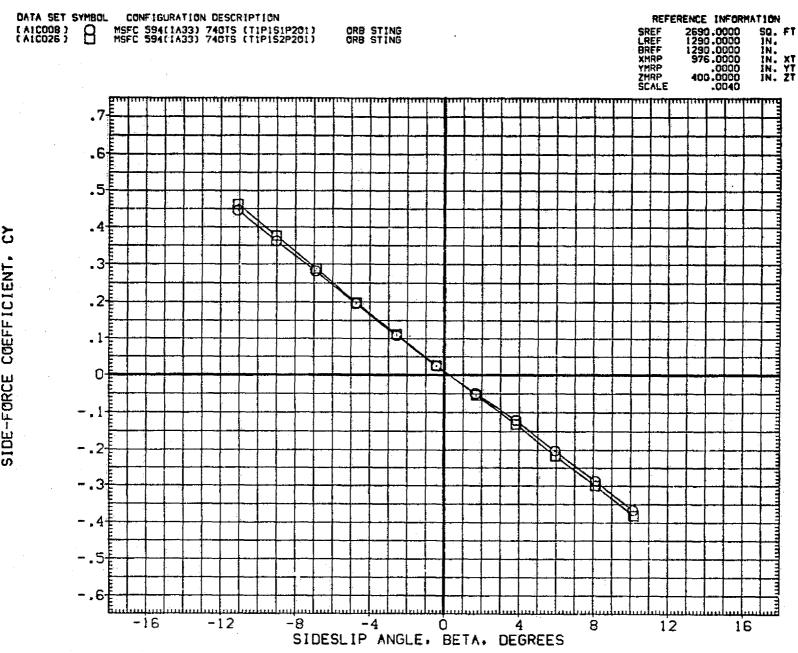
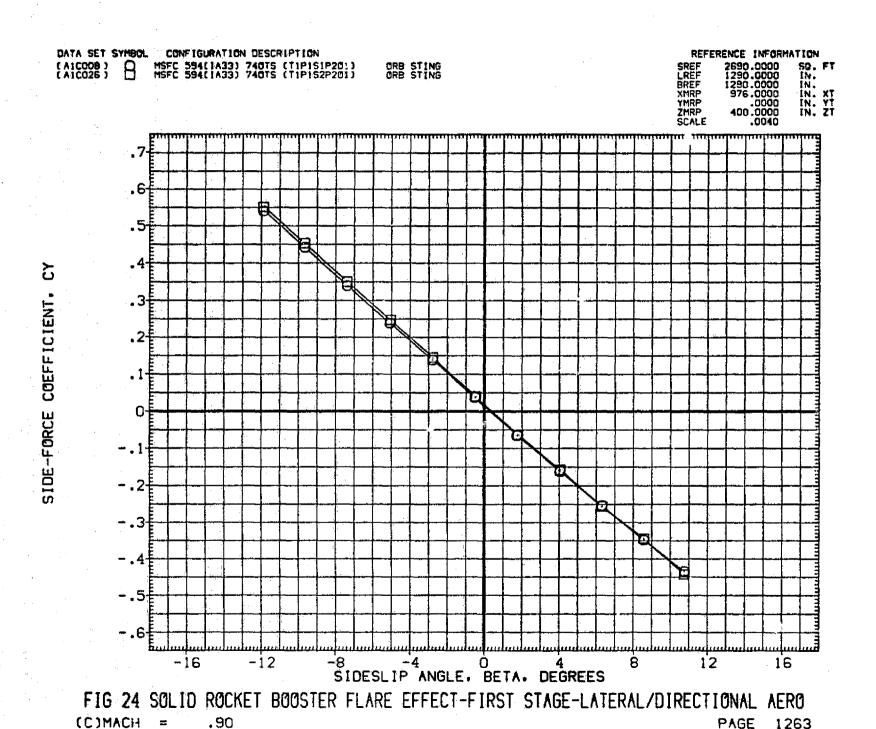
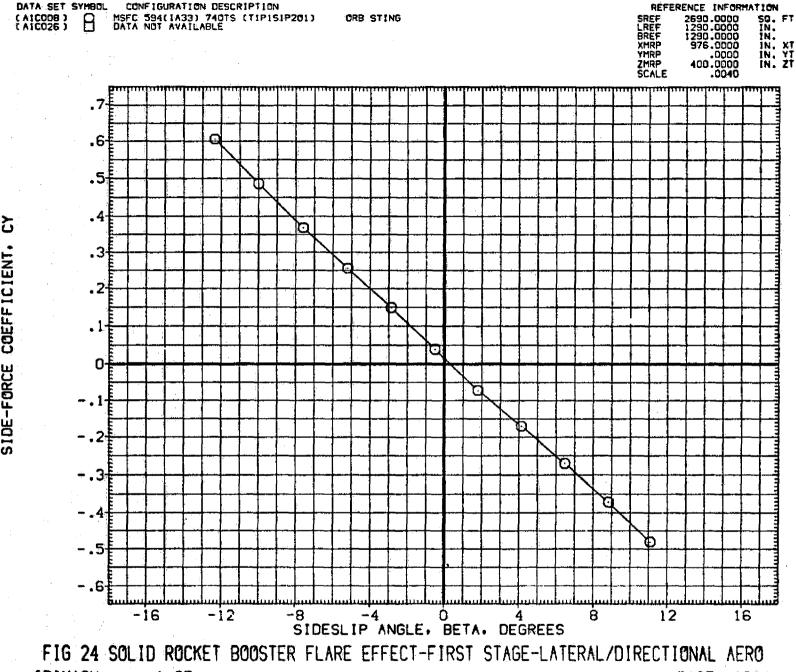


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(A)MACH = .60 PAGE 1261

(B)MACH = PAGE 1262 .80





EDDMACH = 1.05PAGE 1264

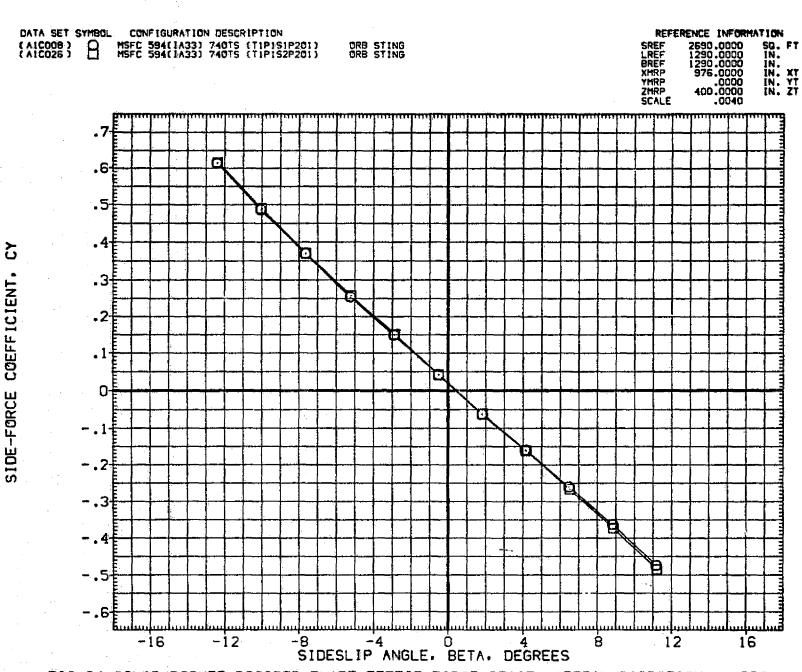


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(E)MACH = 1.10

PAGE 1265

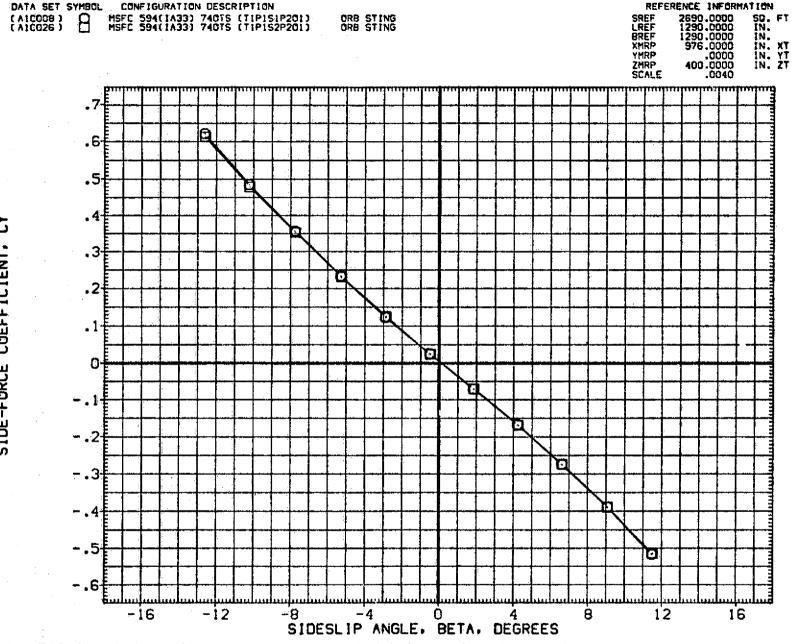


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(F)MACH = 1.25

PAGE 1266

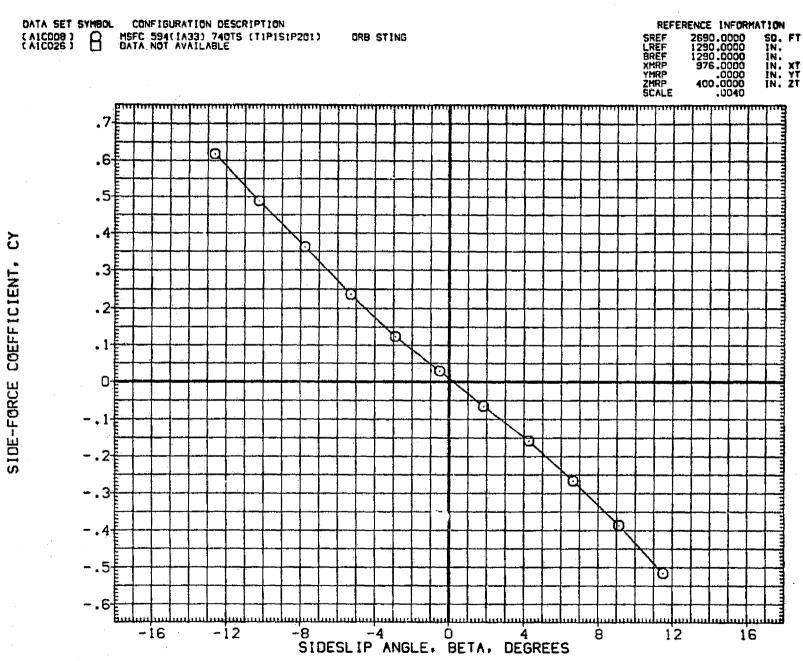


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

CG)MACH = 1.47

PAGE 1267

FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(H)MACH = 1.97

PAGE 1268

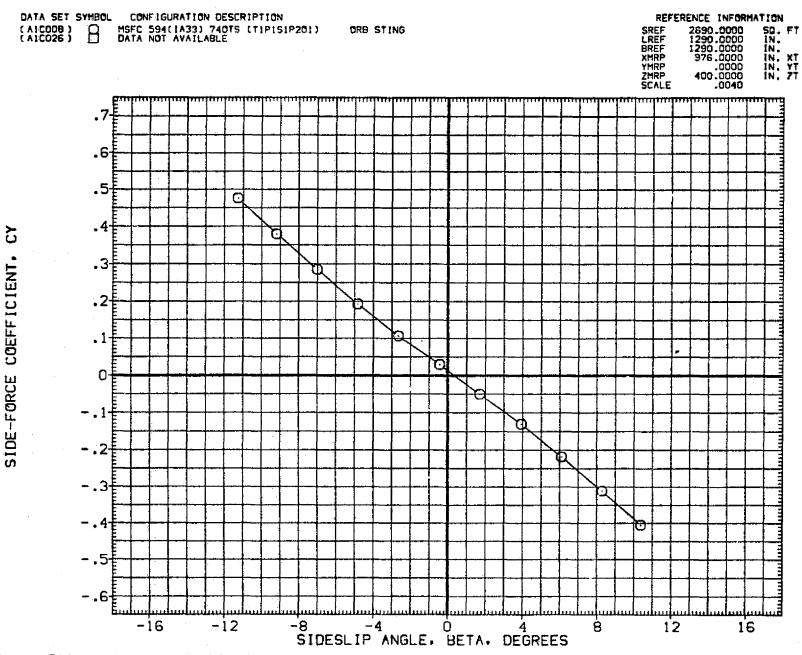
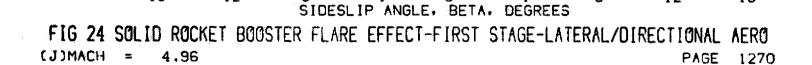


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO
(1)MACH = 2.99

PAGE 1269



12

16

-16

-12

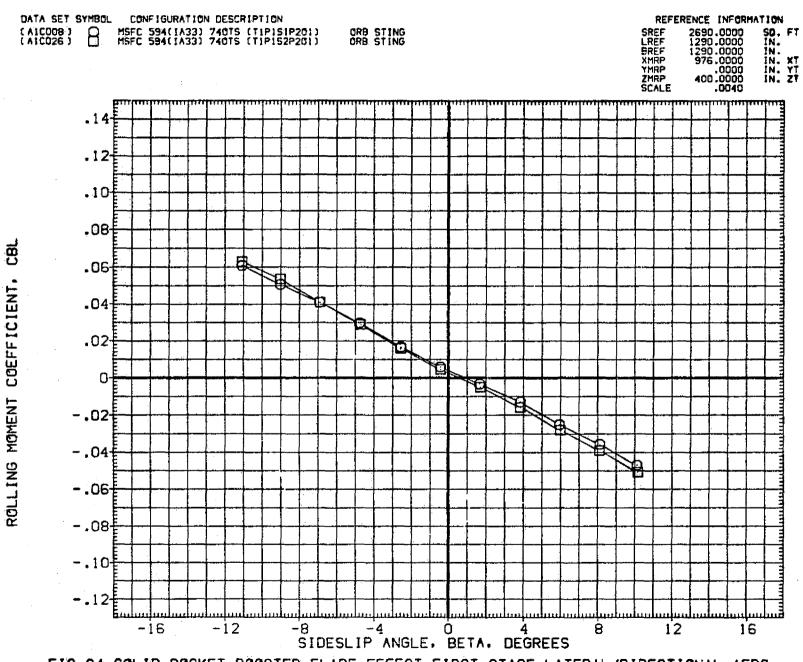


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(A)MACH = .60

PAGE 1271

and the second second and the second second and the second second second second second second second second se

FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(B)MACH = .80

PAGE 1272

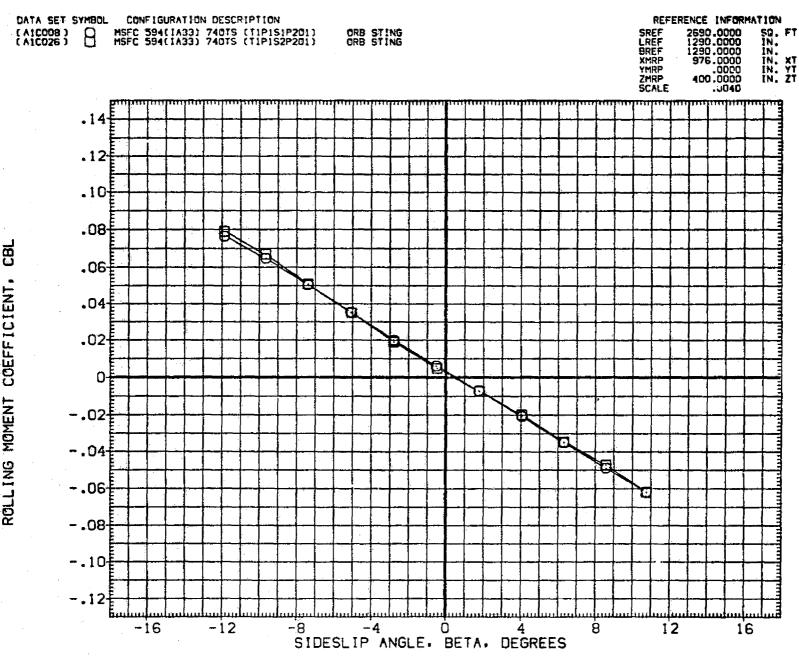


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(C)MACH = .90

PAGE 1273

FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(D)MACH = 1.05

PAGE 1274

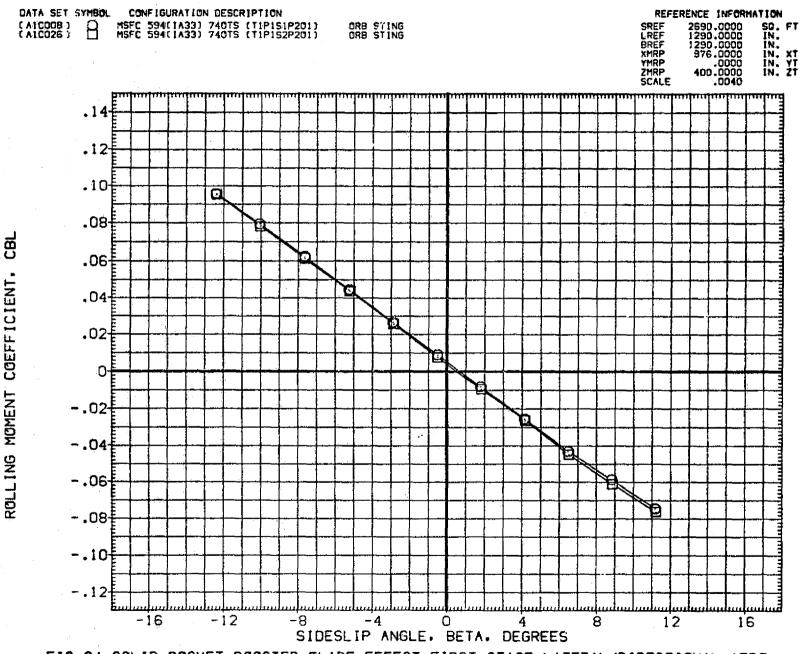
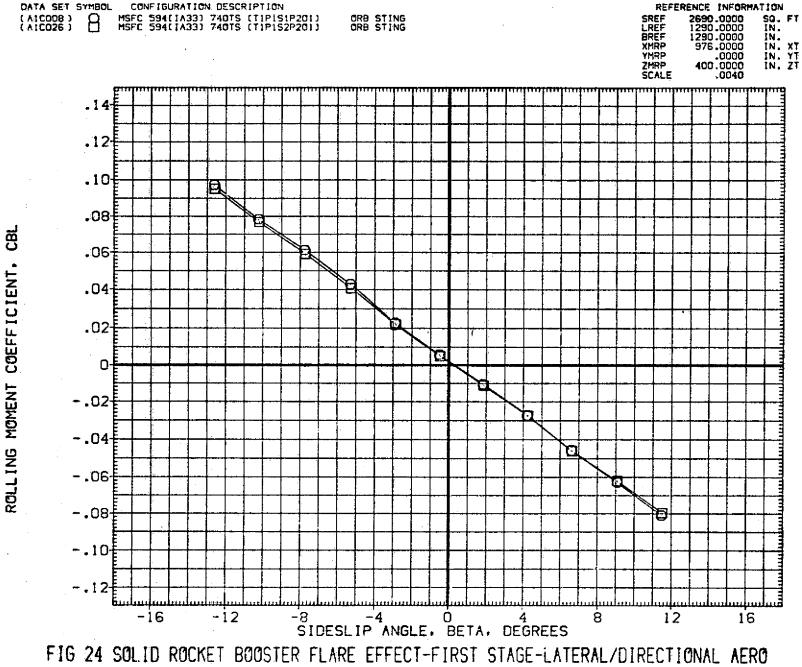


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(E)MACH = 1.10

PAGE 1275



(F)MACH = 1.25PAGE 1276

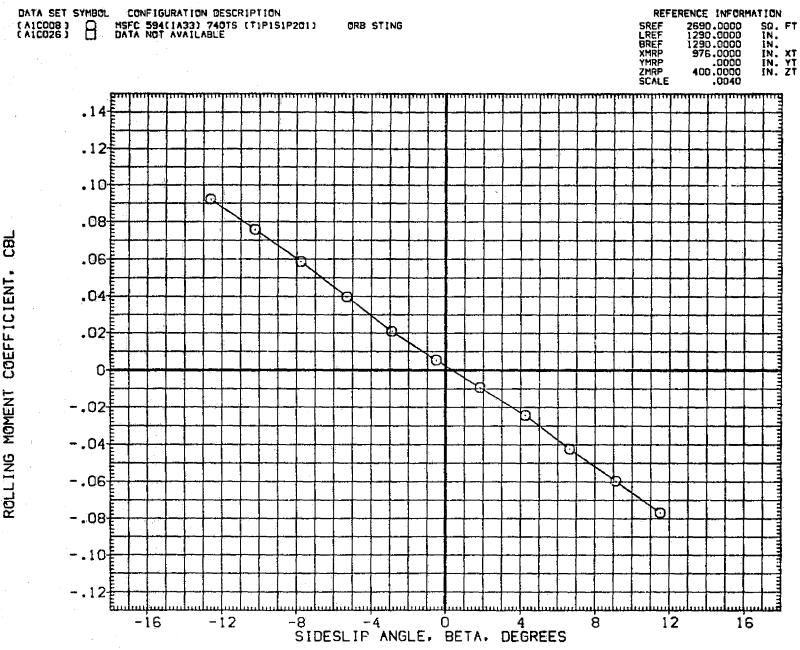


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(G)MACH = 1.47

PAGE 1277

FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(H)MACH = 1.97

PAGE 1278

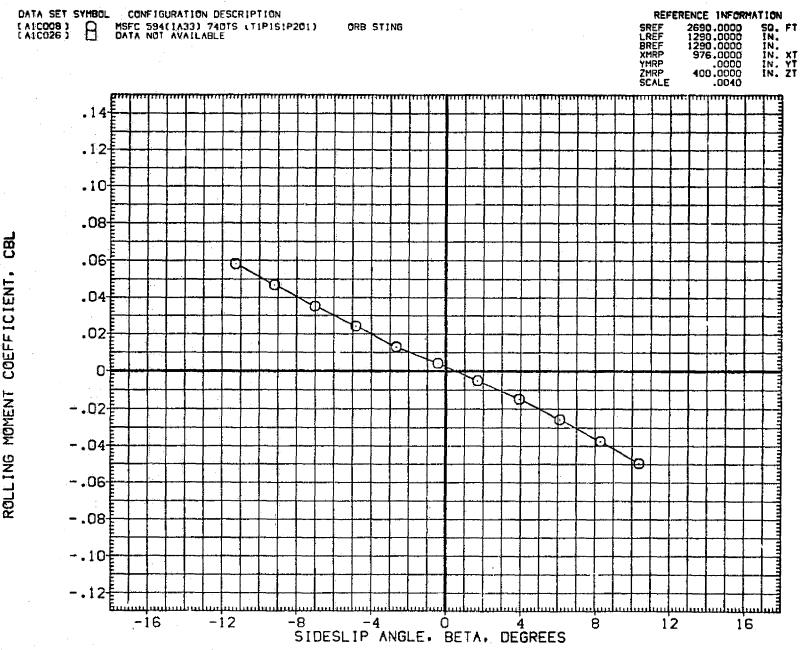


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO
(1)MACH = 2.99

PAGE 1279

FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(J)MACH = 4.96

PAGE 1280

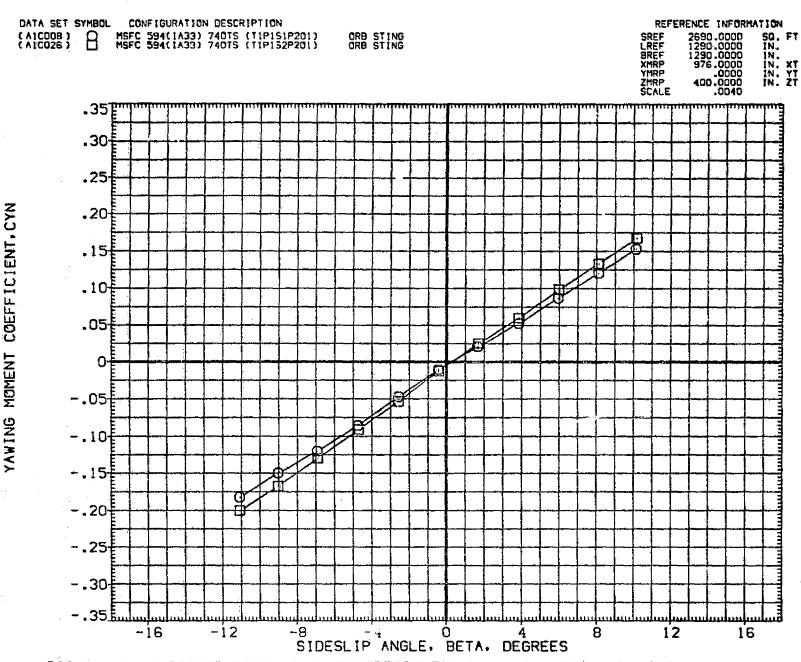


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(A)MACH = .60

PAGE 1281

FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(B)MACH = .80

PAGE 1282

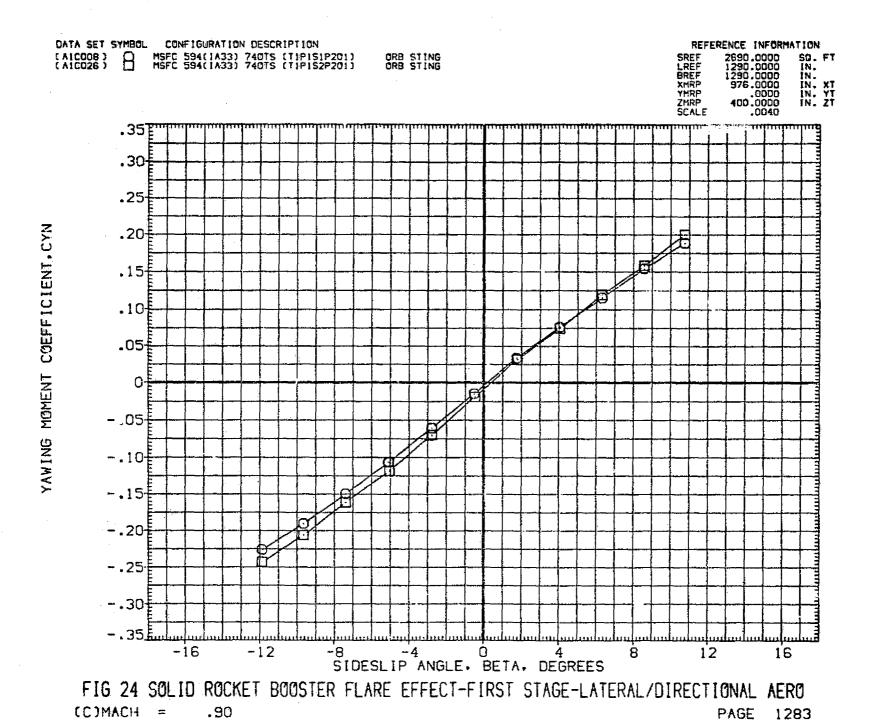


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(D)MACH = 1.05

PAGE 1284

SIDESLIP ANGLE, BETA, DEGREES



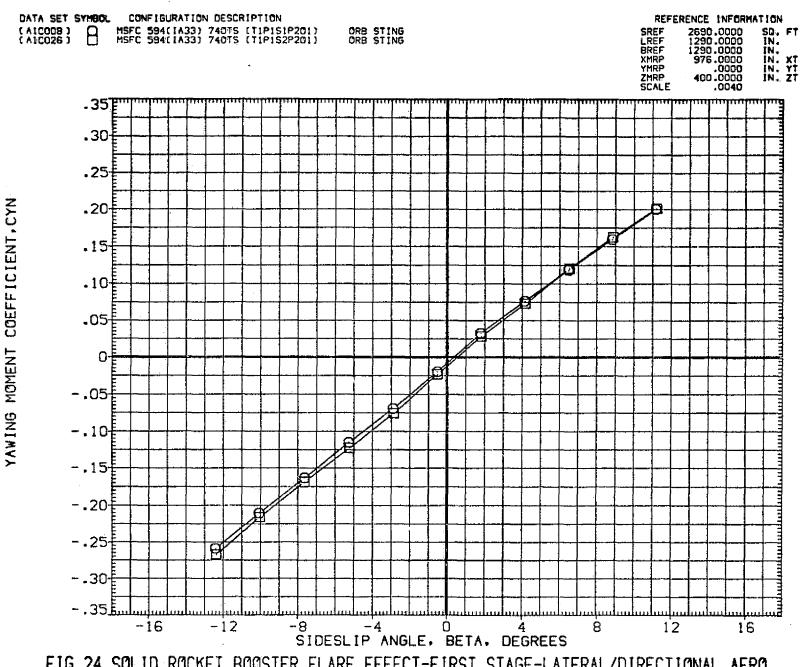
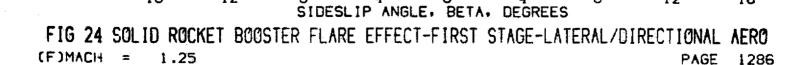


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(E)MACH = 1.10

PAGE 1285



12

16

-.25<del>[</del>

-.30<del>[</del>

سلسةً 35. -

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CONFIGURATION DESCRIPTION MSFC 594(1A33) 740TS (TIPISIP201) DATA NOT AVAILABLE SREF LREF BREF XMRP YMRP ZMRP ZMRP SCALE SQ. FT IN. IN. IN. KT IN. YT IN. ZT ORB STING .30€ .25 .20 .15<del>[</del> .10 .05 YAWING MOMENT -.05<del>{</del> -.10 -.15 -.20 -.30<del>[</del> -12 -8 -4 0 4
SIDESLIP ANGLE, BETA, DEGREES 12 16

FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(G)MACH = 1.47

PAGE 1287

FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

[H]MACH = 1.97

PAGE 1288

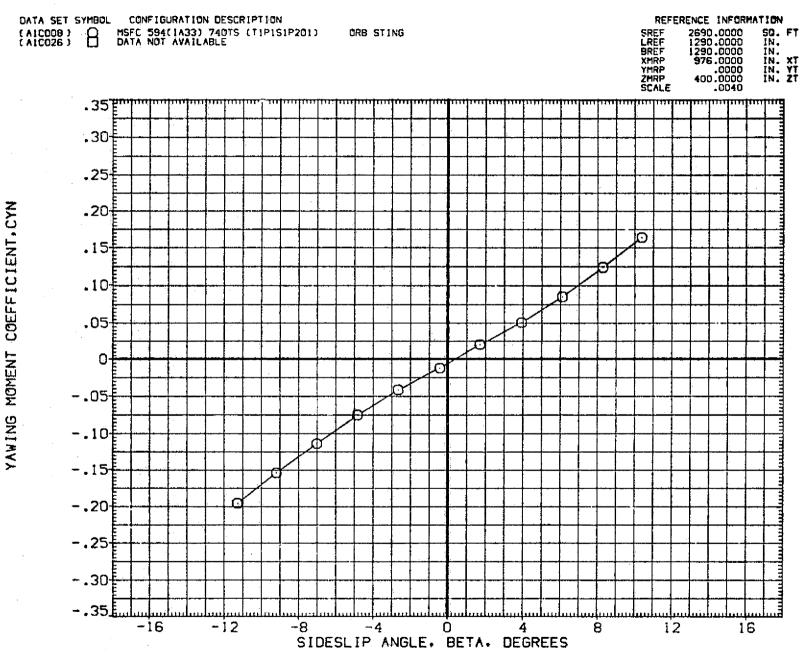


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(1)MACH = 2.99

PAGE 1289

FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(J)MACH = 4.96

PAGE 1290

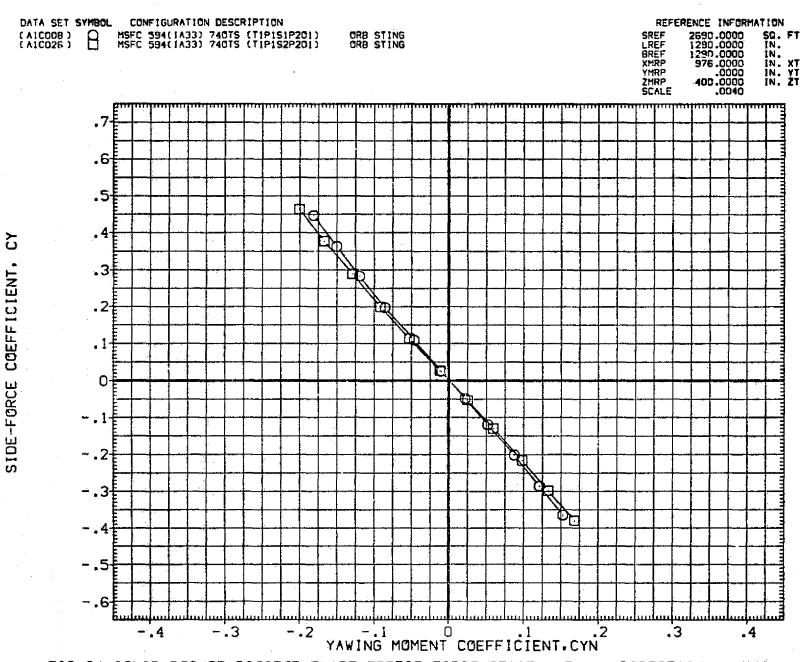


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(A)MACH = .60

PAGE 1291

SIDE-FØRCE COEFFICIENT.



FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(B)MACH = .80

PAGE 1292

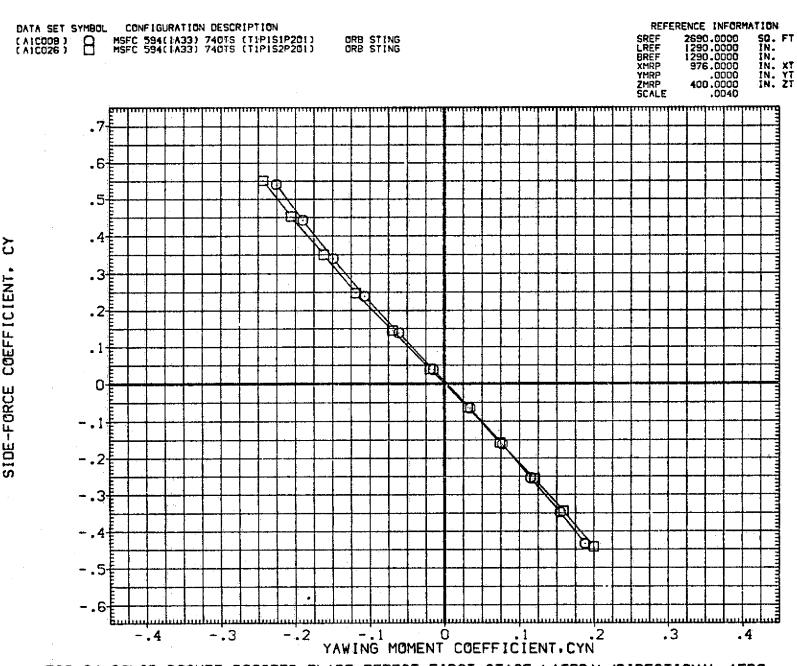


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(C)MACH = .90 PAGE 1293

Trick I have the telegraphic for the control of the

(D)MACH = 1.05PAGE 1294

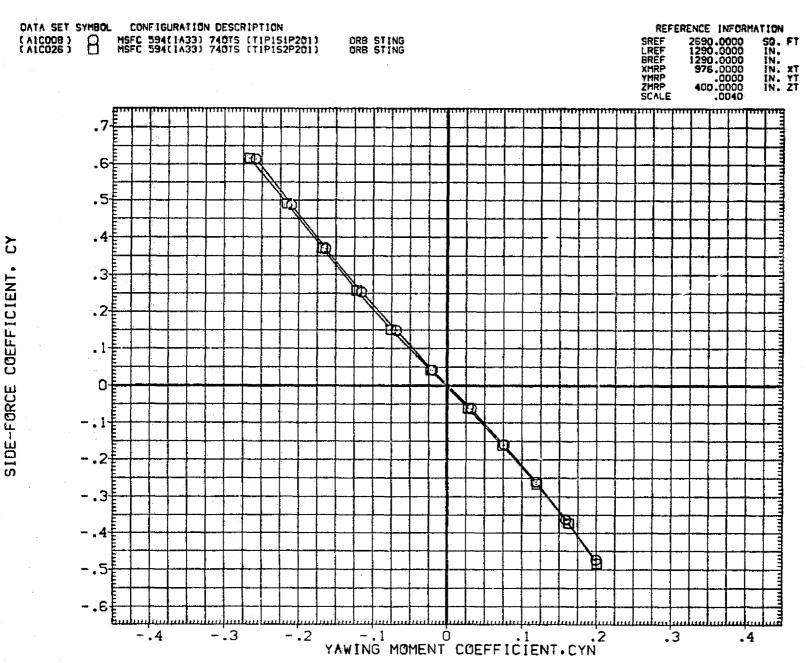


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(E)MACH = 1.10

PAGE 1295

FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(F)MACH = 1.25

PAGE 1296

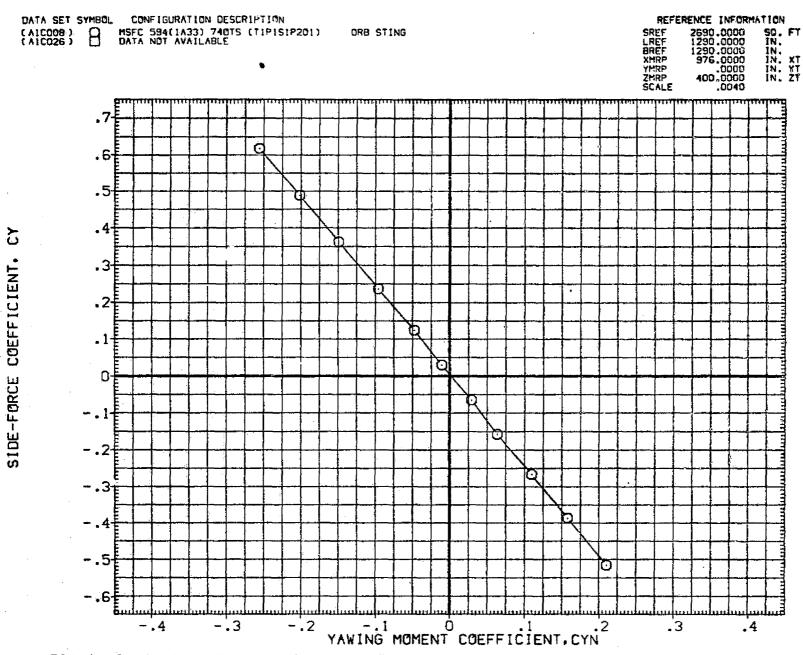


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(G)MACH = 1.47

PAGE 1297

FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(H)MACH = 1.97

PAGE 1298

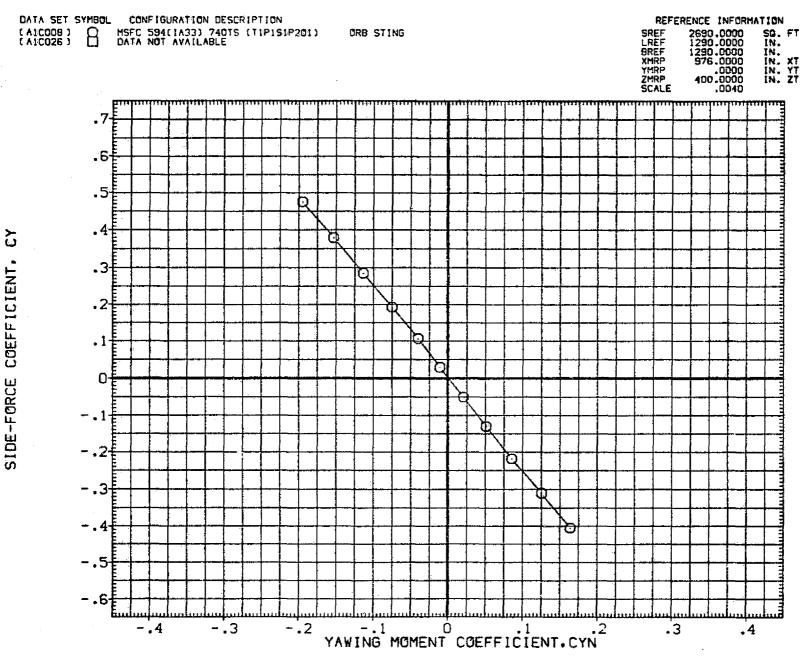


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO
(1)MACH = 2.99

PAGE 1299

FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(J)MACH = 4.96

PAGE 1300

YAWING MOMENT COEFFICIENT, CYN

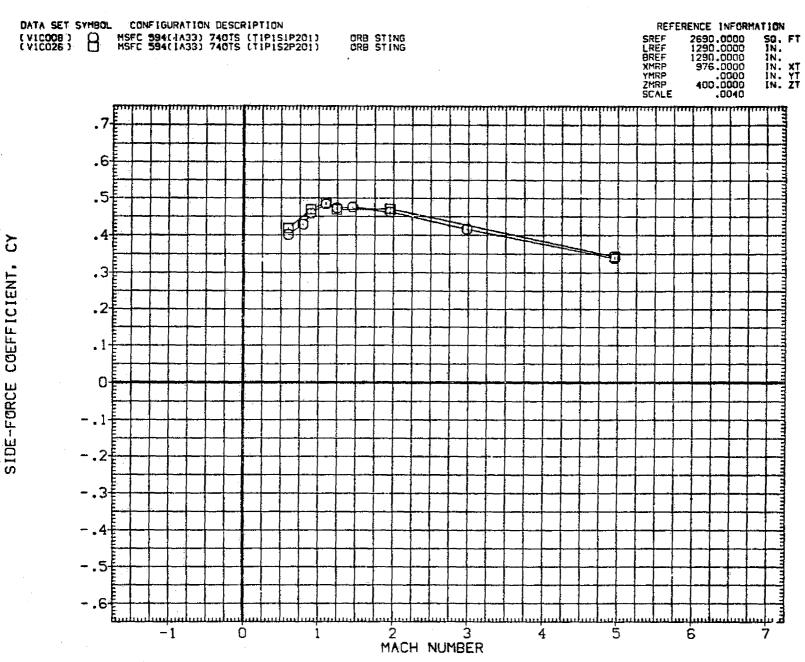


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(A)BETA = -10.00

PAGE 1301

FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(B)BETA = -8.00

PAGE 1302

MACH NUMBER



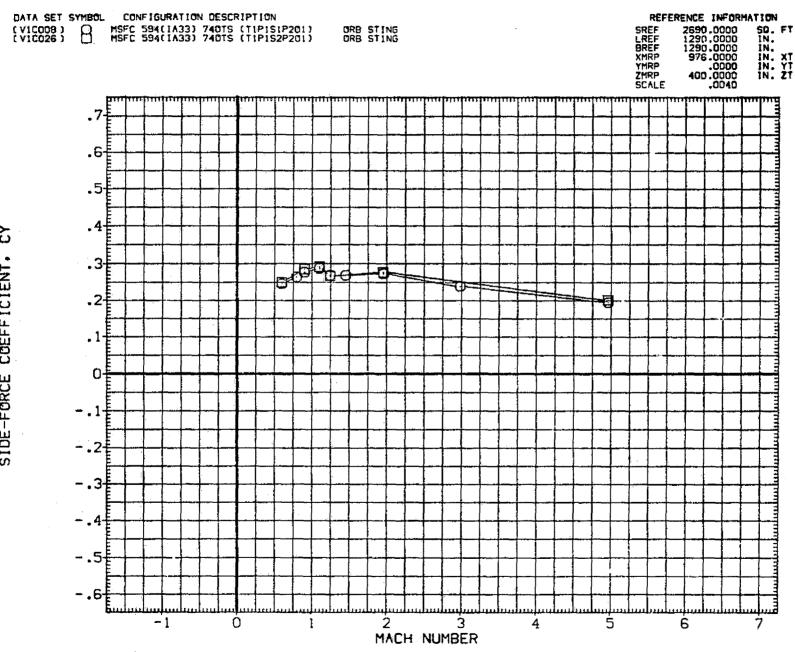


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(C)BETA = -6.00

PAGE 1303

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SIDE-FORCE COEFFICIENT,

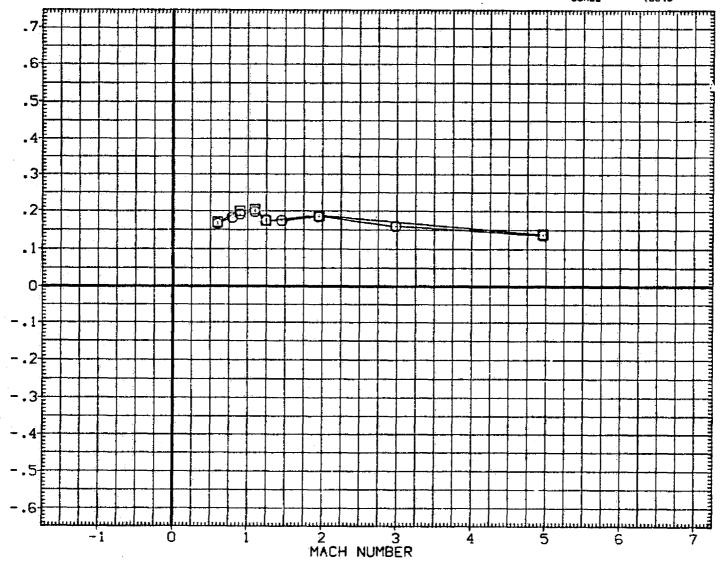


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(D)BETA = -4.00

PAGE 1304

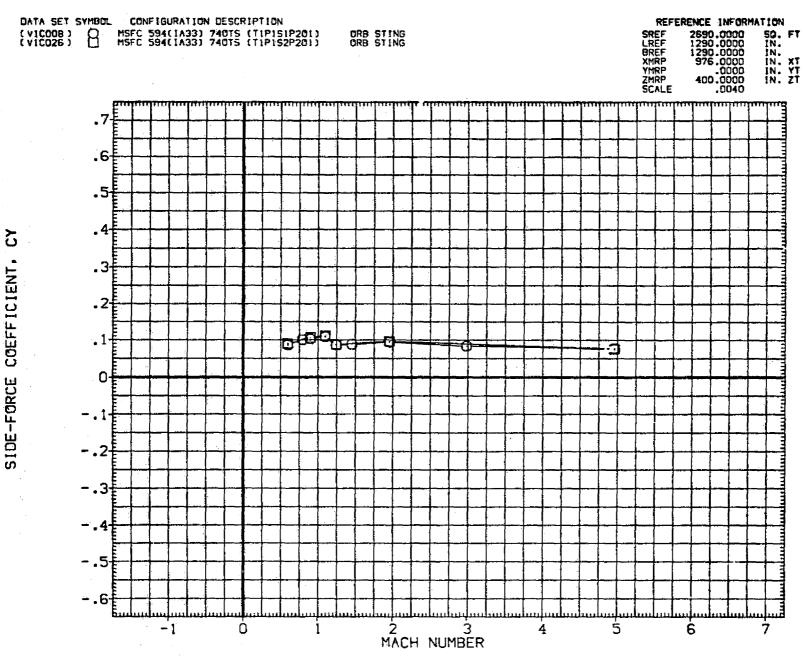


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(E)BETA = -2.00

PAGE 1305



FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(F)BETA = .00.

PAGE 1306

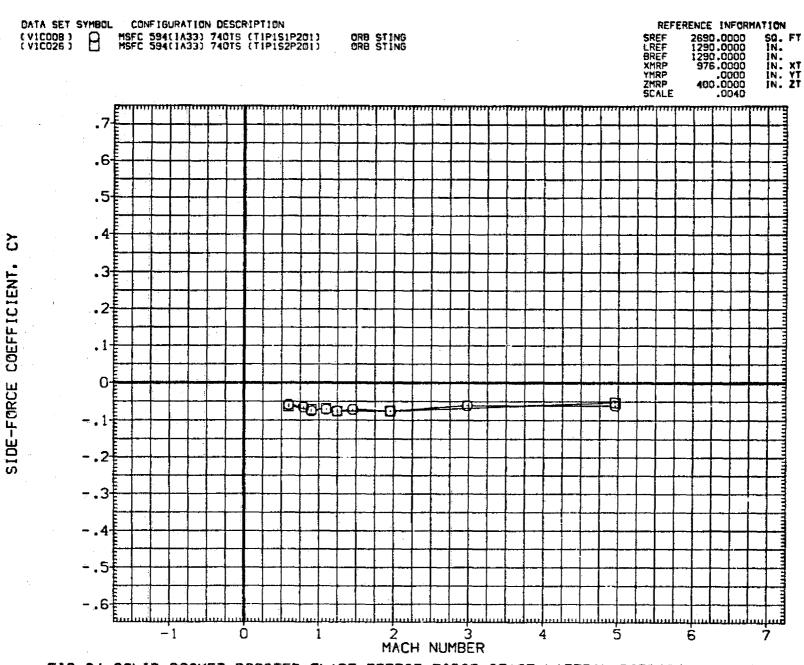


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(G)BETA = 2.00

PAGE 1307

SIDE-FORCE COEFFICIENT.

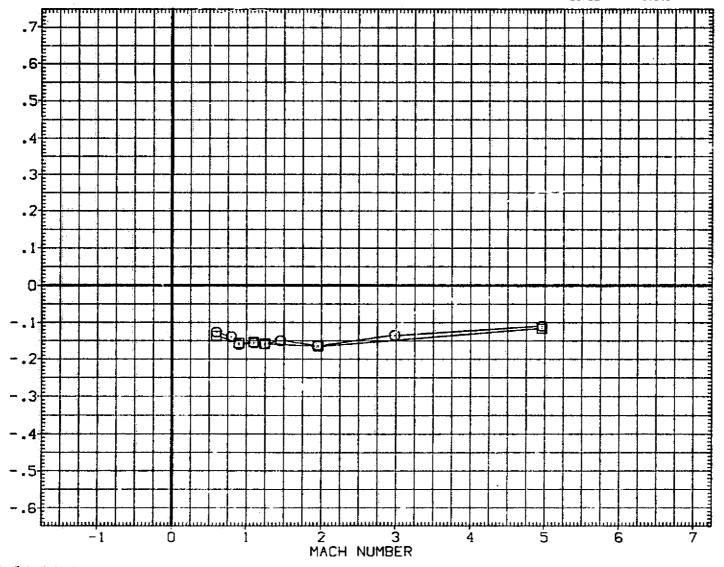


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(H)BETA = 4.00

PAGE 1308

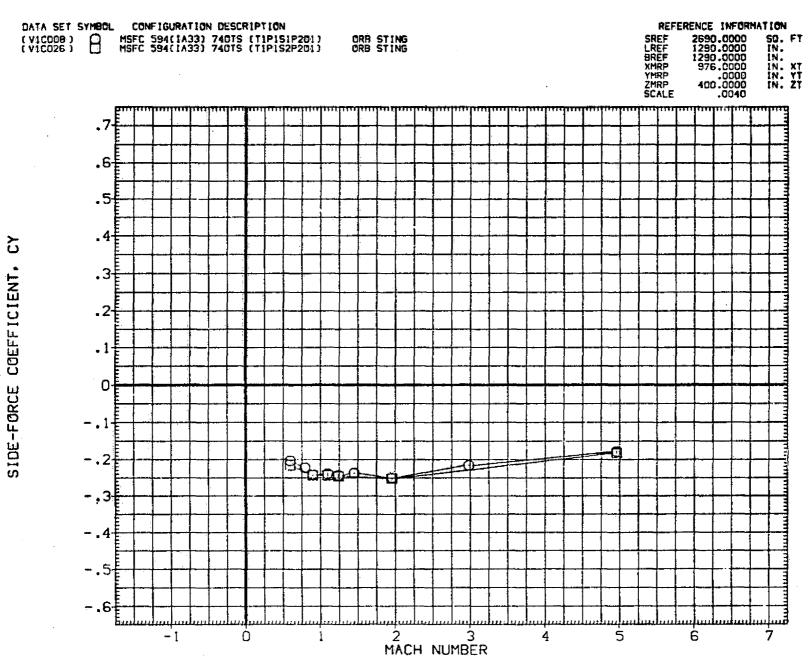
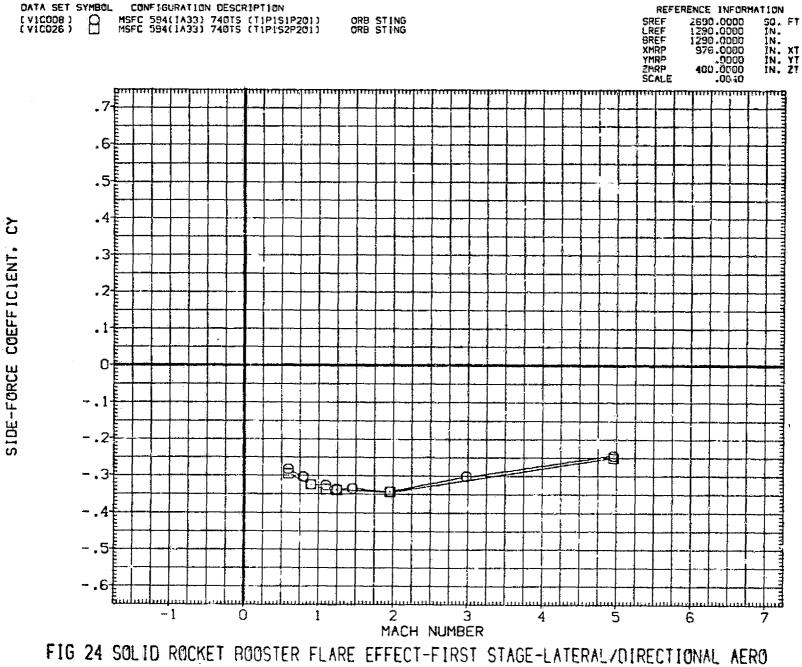


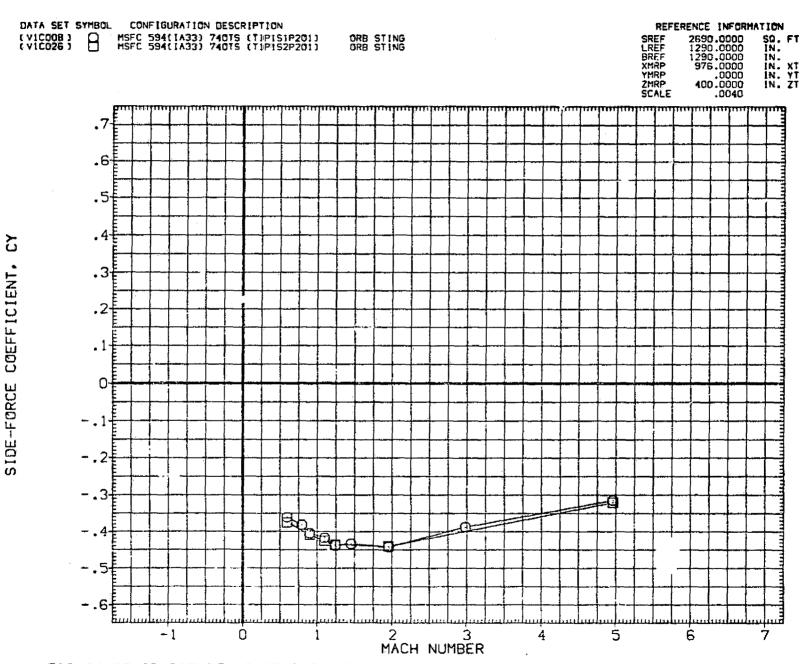
FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(1) BETA = 6.00

PAGE 1309



(J)BET: = 8.00 PAGE 1310



£3

FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(K)BETA = 10.00 A

PAGE 1311

FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(A)BETA = -10.00

PAGE 1312

MACH NUMBER

O

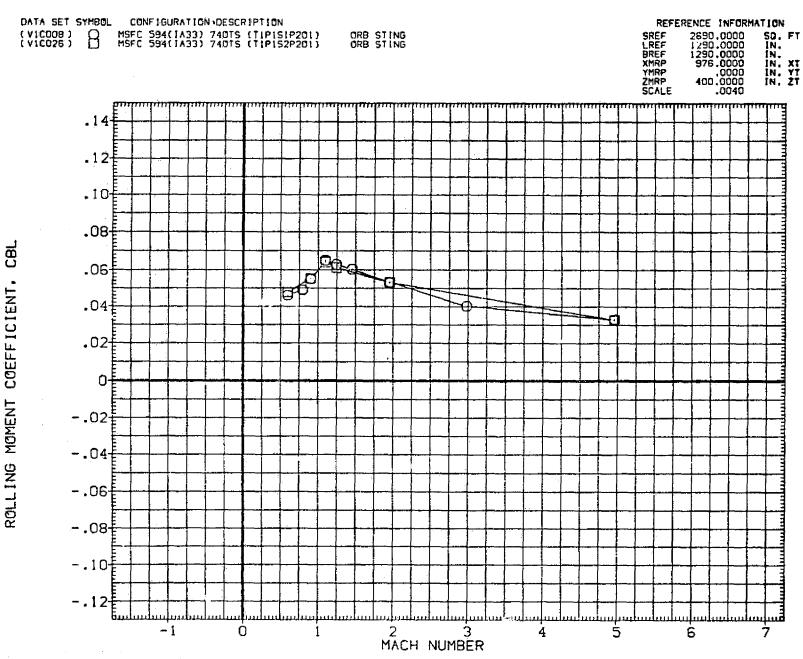


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(B)BETA = -8.00

PAGE 1313

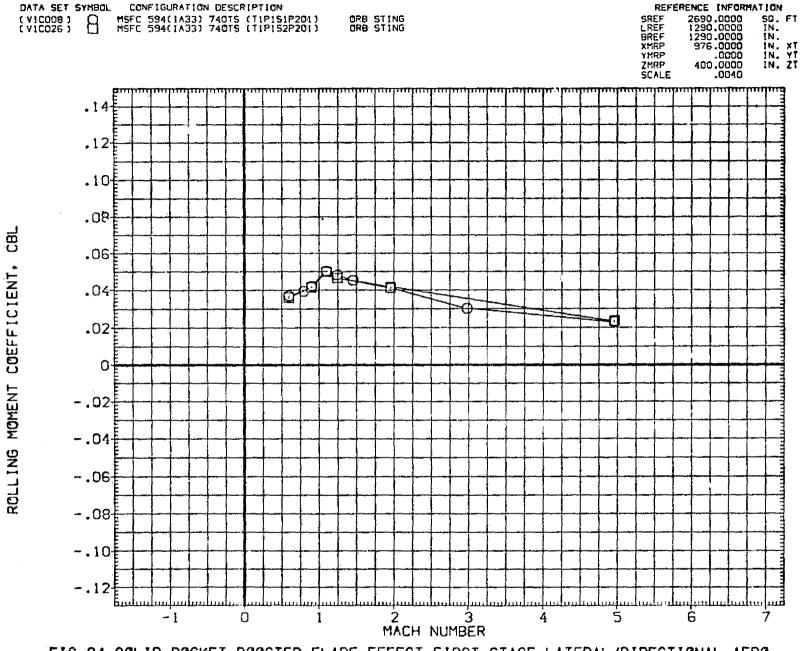


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(C)BETA = -6.00

PAGE 1314





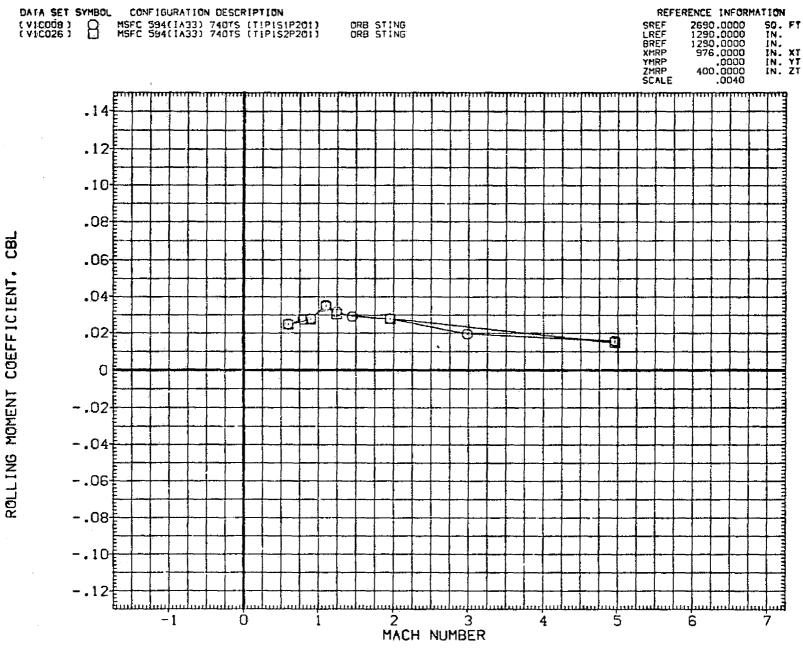


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(D)BETA = -4.00

PAGE 1315

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FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(E)BETA = -2.00

PAGE 1316

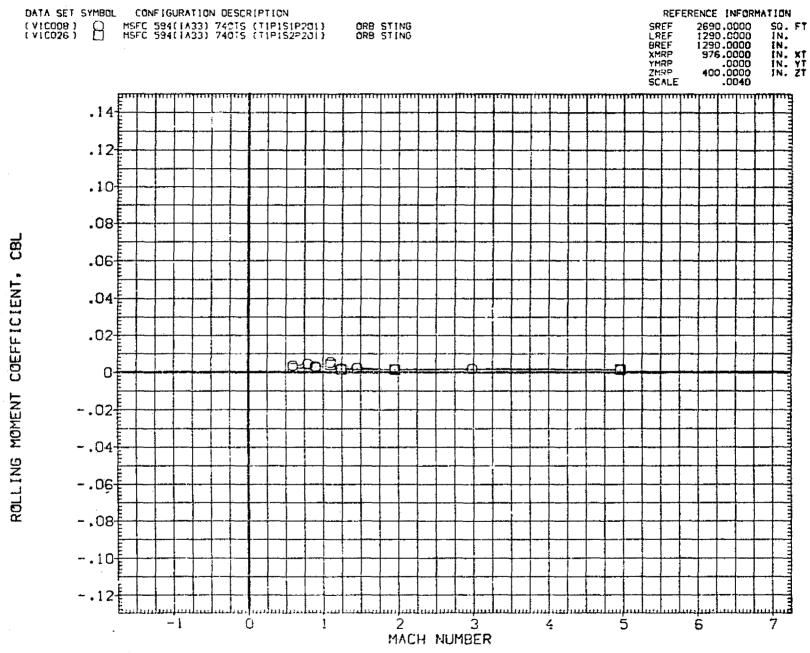


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(F)BET = .00 PAGE 1317

FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO
(G)BETA = 2.00
PAGE 1318

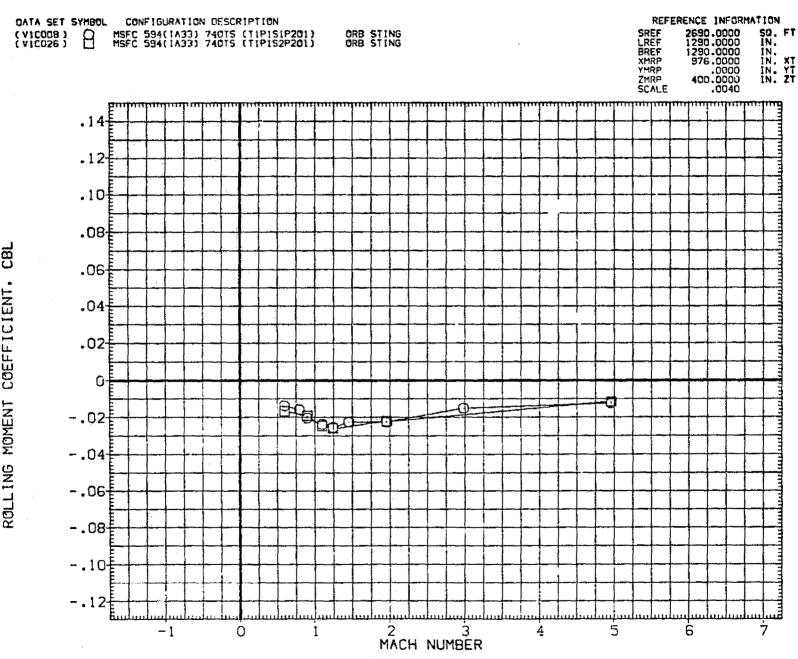


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(H)BETA = 4.00

PAGE 1319

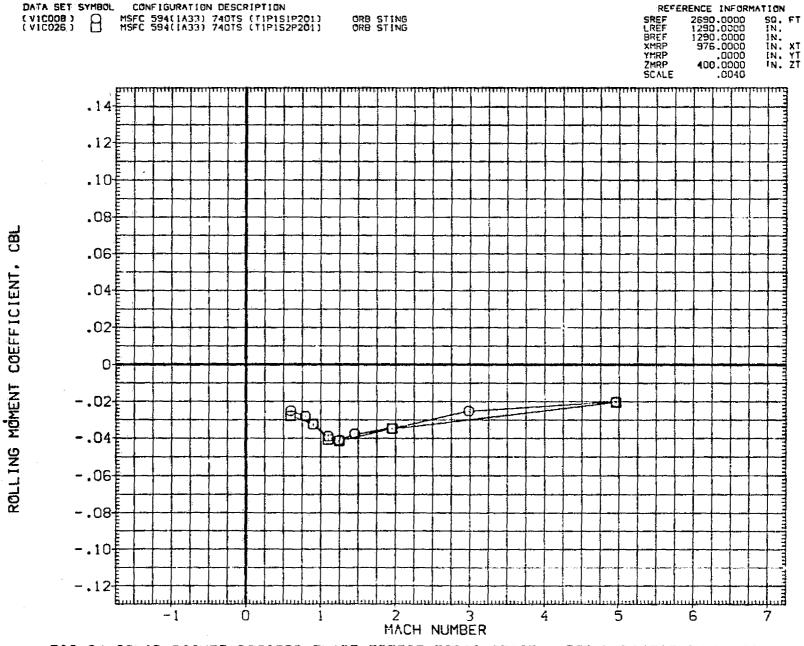


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO
(1)BETA = 6.00

PAGE 1320

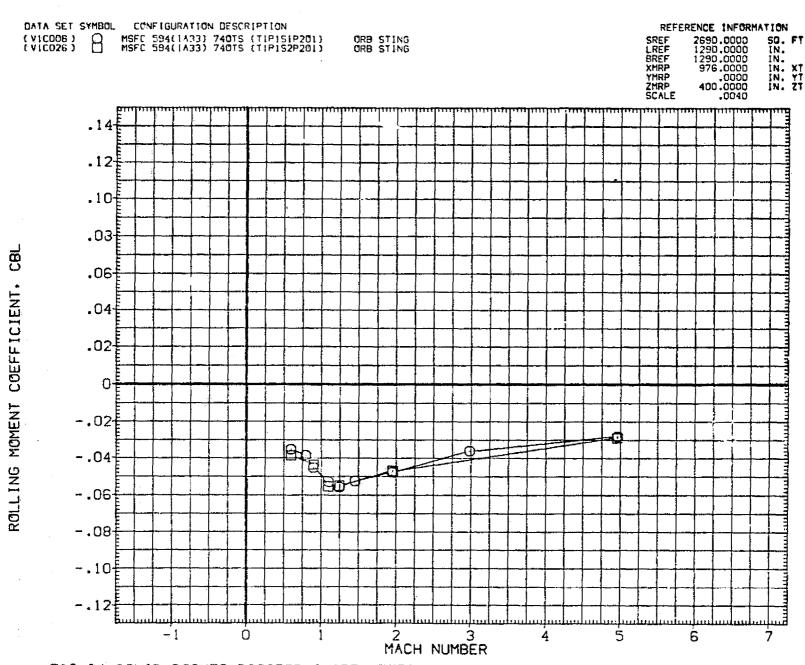


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(J)BETA = 8.00

PAGE 1321

FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

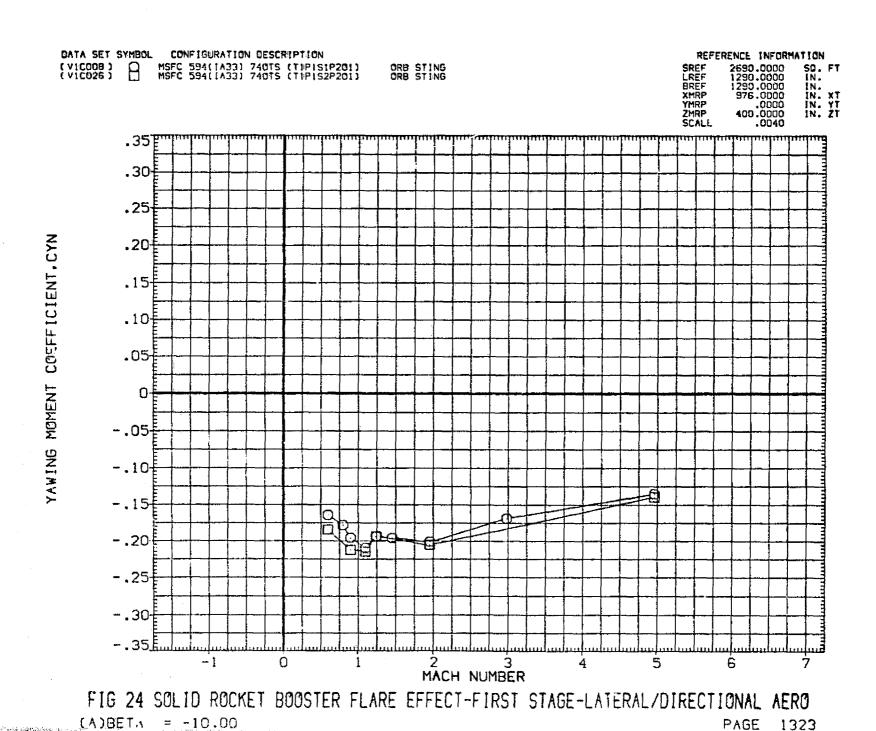
(K)BETA = 10.00

PAGE 1322

MACH NUMBER

5

0



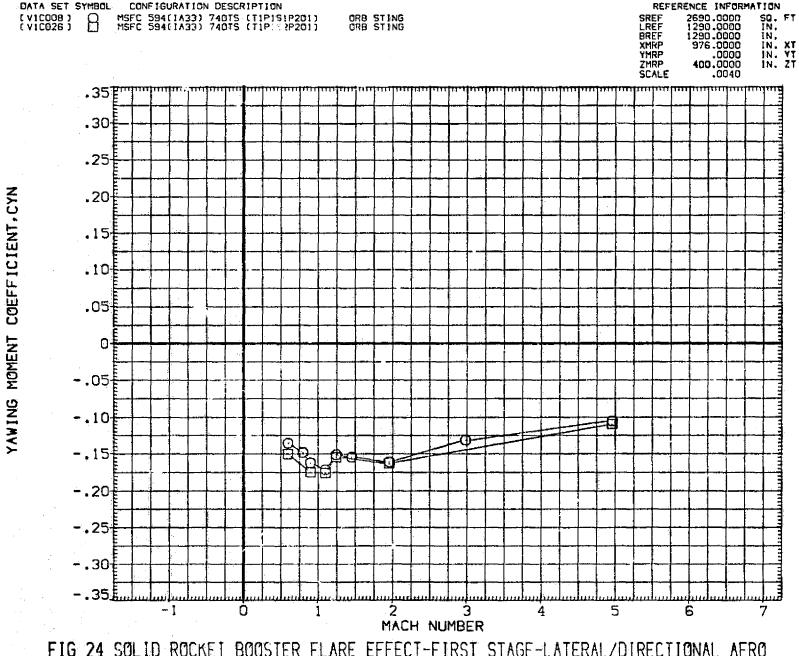


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(B)BETA = -8.00

PAGE 1324

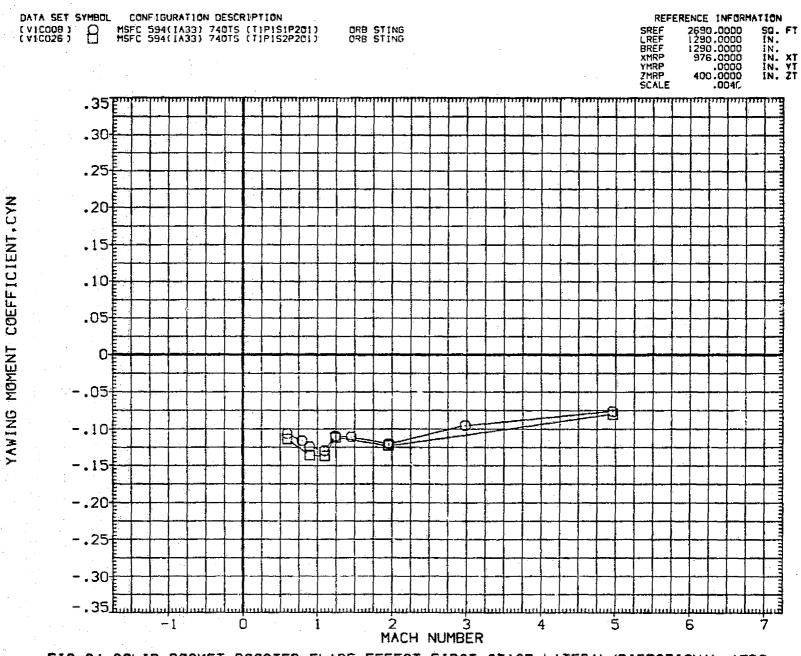


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(C)BETA = -6.00

PAGE 1325

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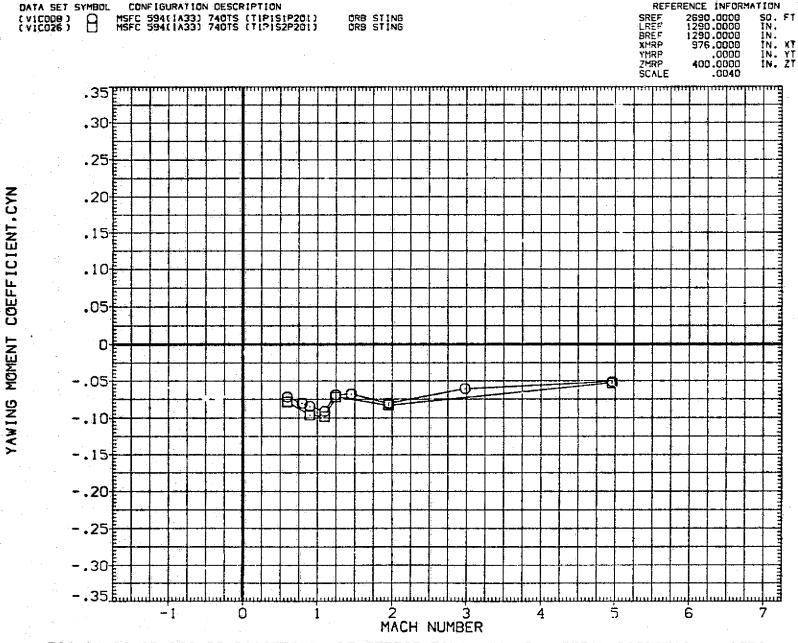


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(D)BETA = -4.00

PAGE 1326

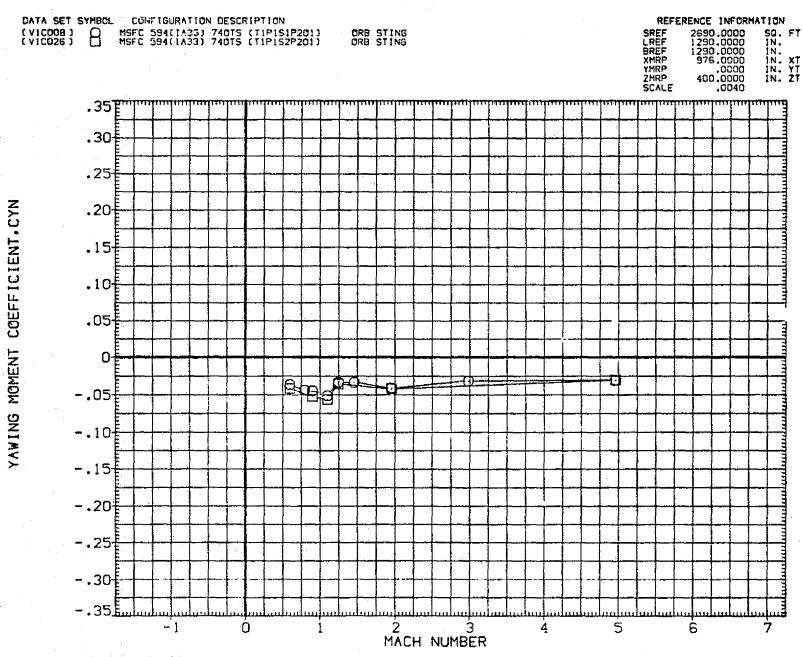


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(E)BETA = -2.00

PAGE 1327

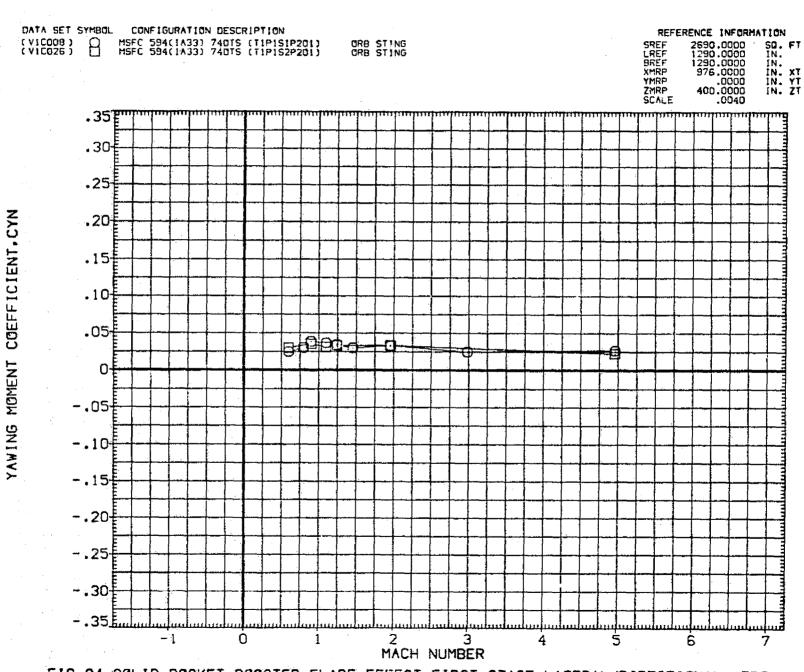


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

[G]BET. = 2.00

PAGE 1329

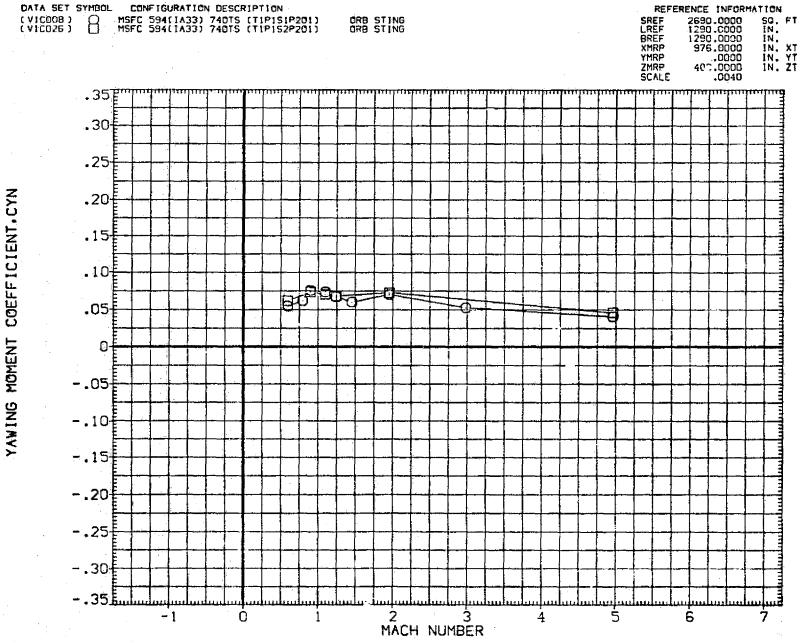


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(H)BETA = 4.00

PAGE 1330

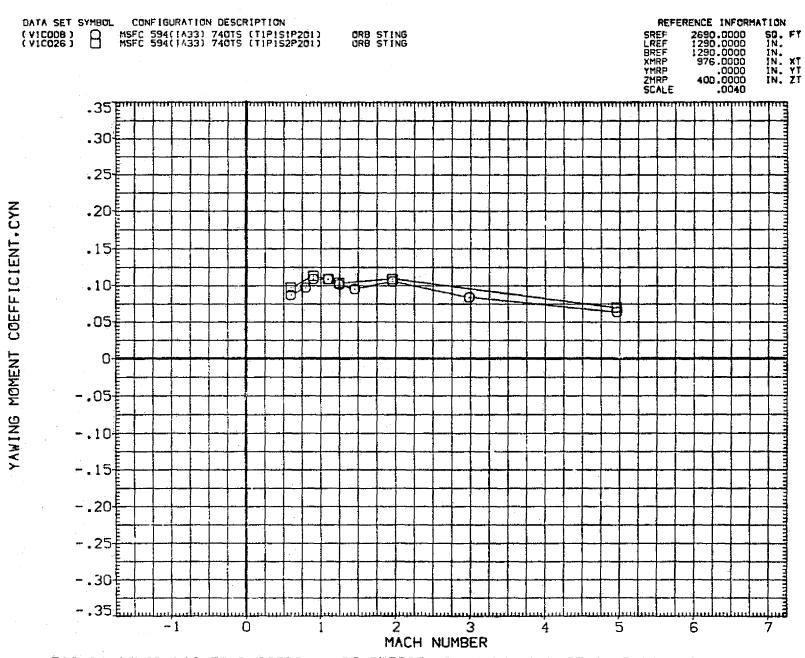


FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

CIDBETA = 6.00 PAGE 1331

redition the teach of the same the adjustment of the strength of the strength of the strength of the strength of the same that the same that the strength of t

FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIGST STAGE-LATERAL/DIRECTIONAL AERO

(J)BETA = 8.00

PAGE 1332



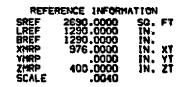
FIG 24 SOLID ROCKET BOOSTER FLARE EFFECT-FIRST STAGE-LATERAL/DIRECTIONAL AERO

(K)BETA = 10.00

PAGE 1333

COEFFICIENT,

NORMAL FORCE



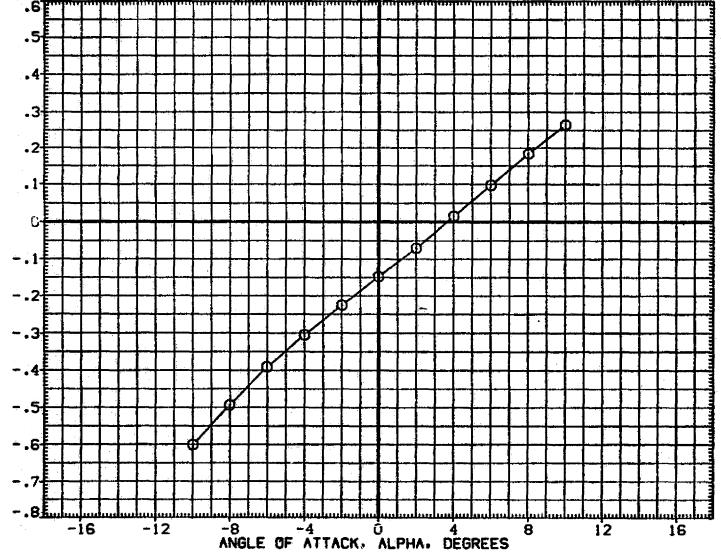


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(A)MACH = .60

PAGE 1334

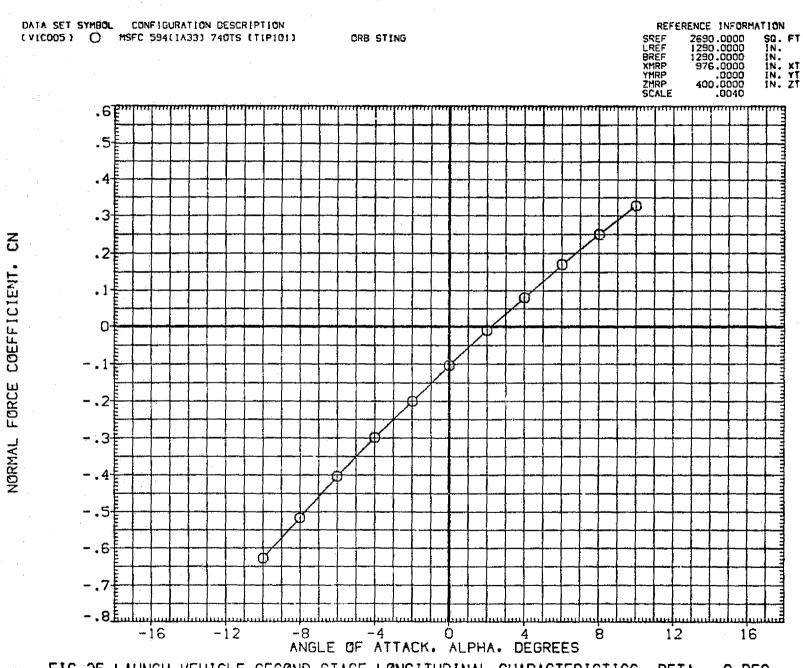
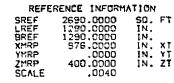


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(B)MACH = .90

PAGE 1335

NORMAL FORCE COEFFICIENT,



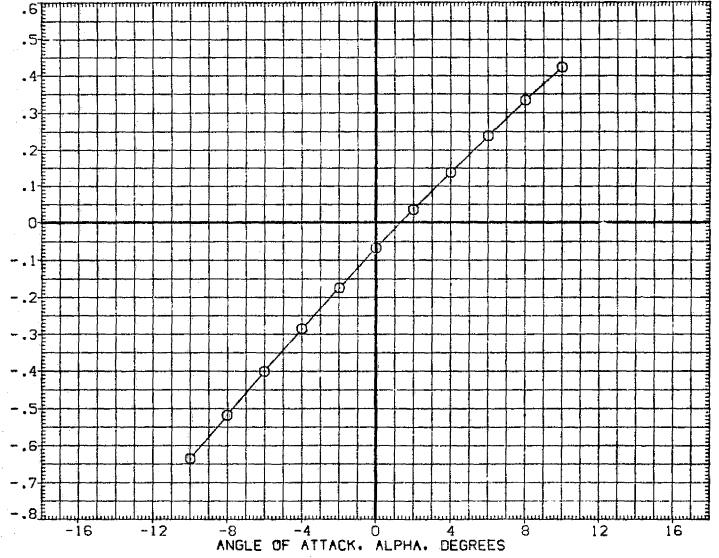


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG
(C)MACH = 1.10
PAGE 1336

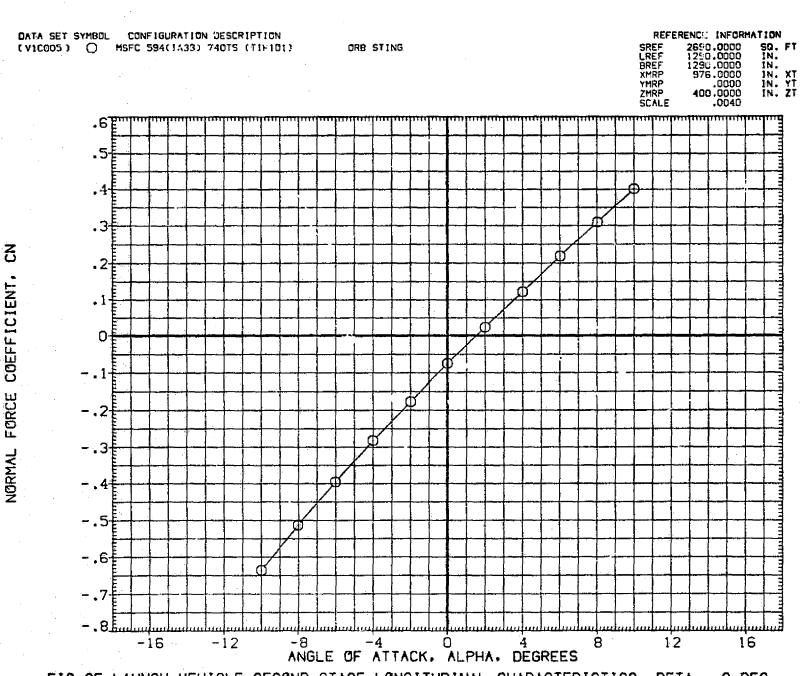
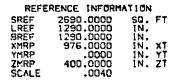


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(D)MACH = 1.25

PAGE 1337

the second secon



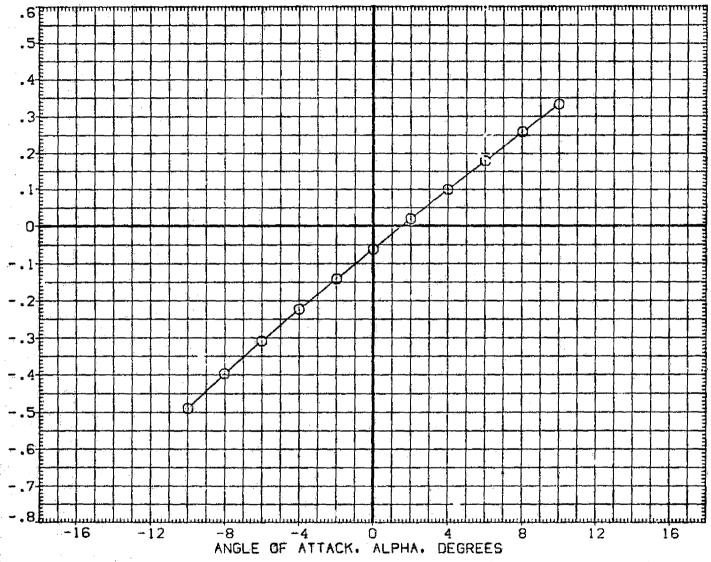


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(E)MACH = 1.96

PAGE 1338

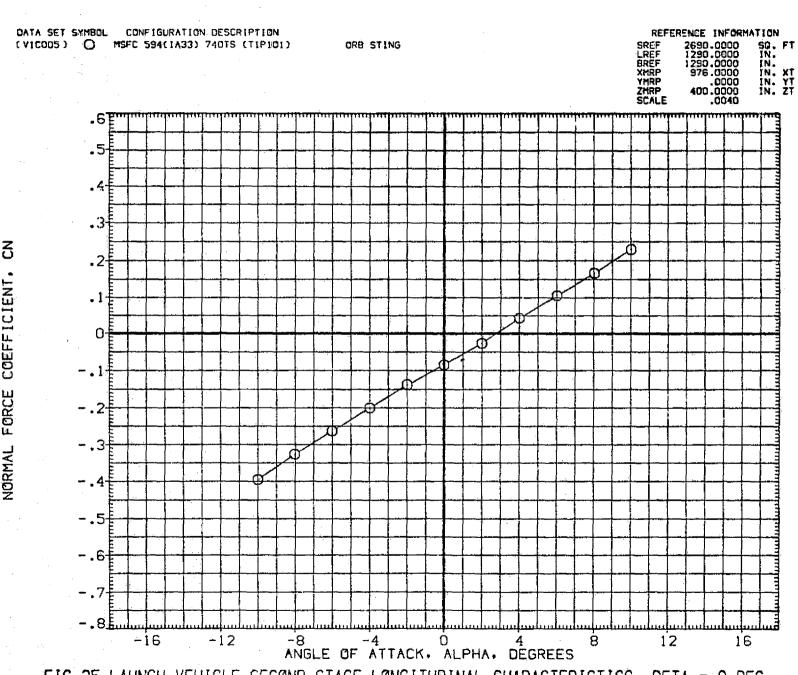
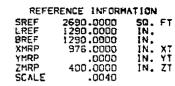


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(E)MACH = 2.99

PAGE 1339



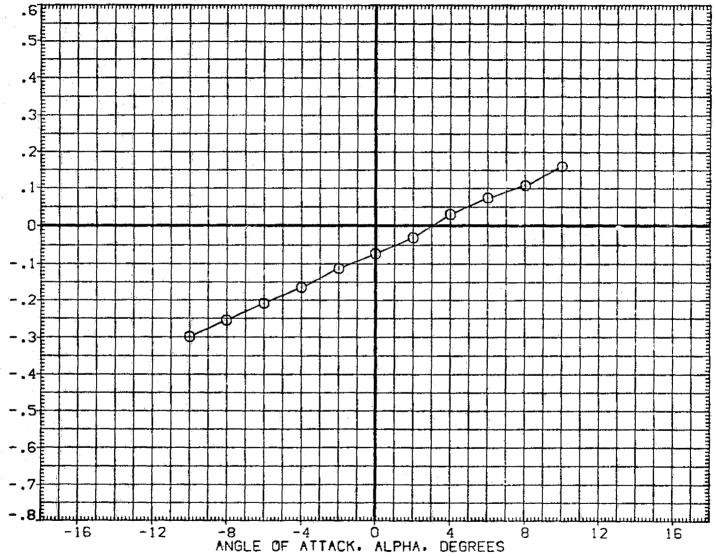


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG
(G)MACH = 4.96
PAGE 1340

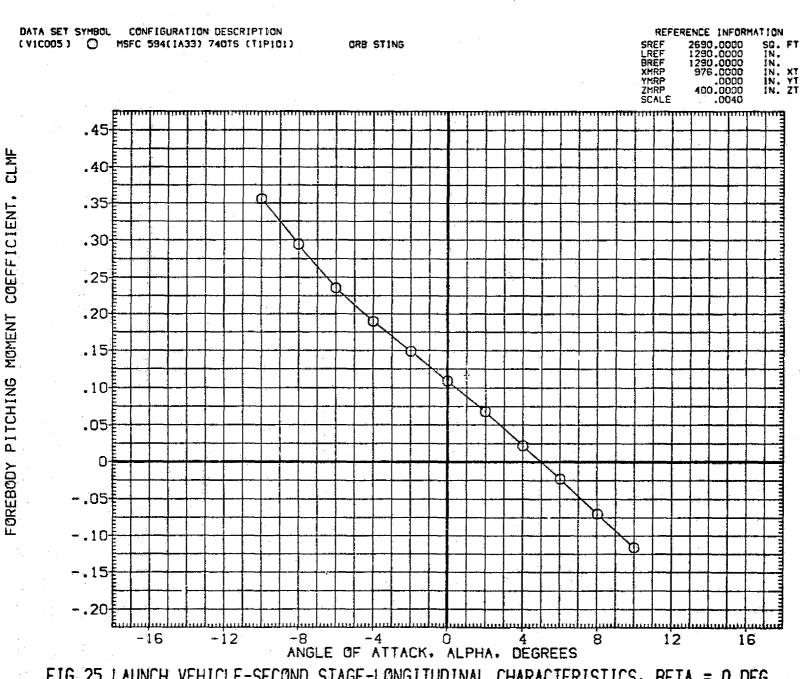
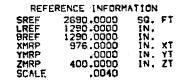


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

[A]MACH = .60

PAGE 1341

and the second second



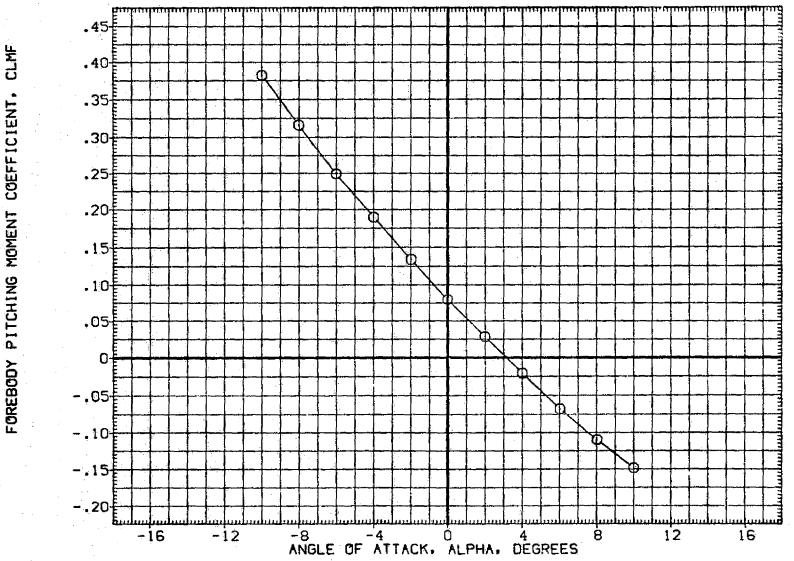


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(B)MACH = .90

PAGE 1342

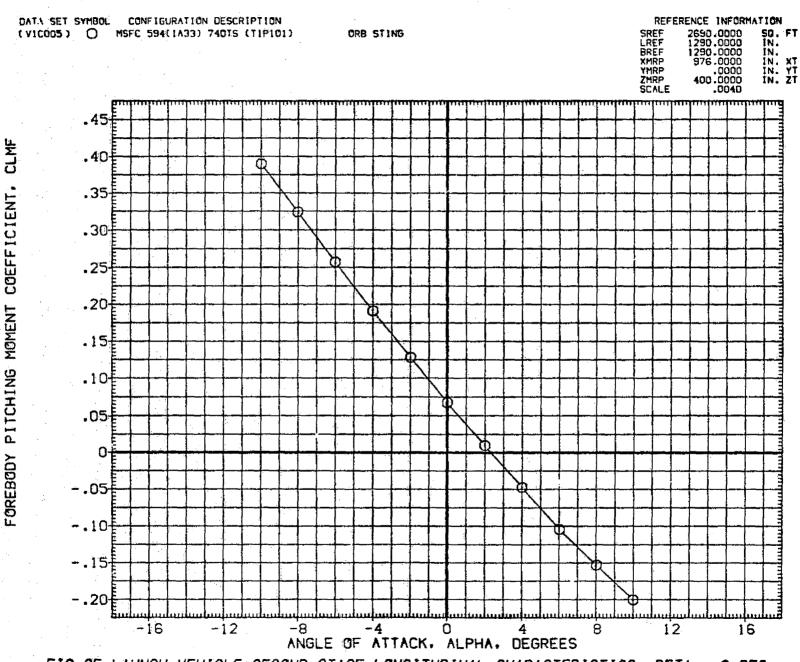
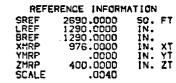


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

[C]MACH = 1.10

PAGE 1343



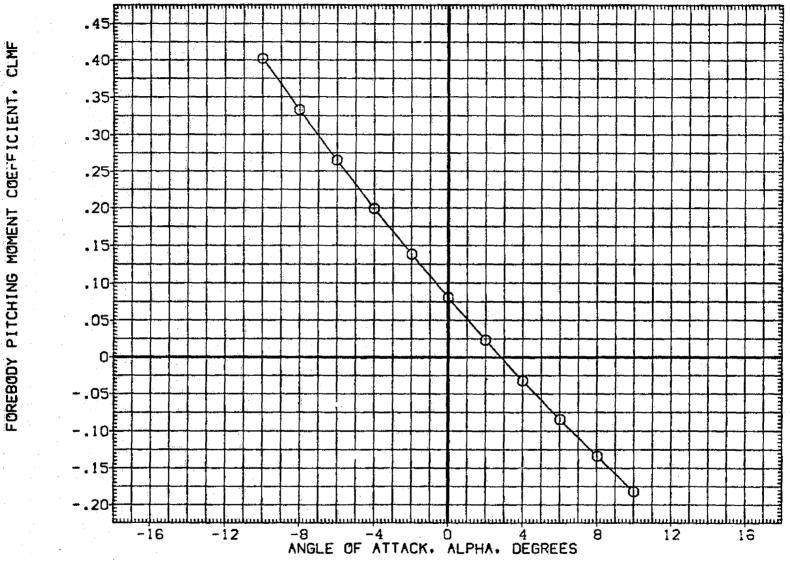


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(D)MACH = 1.25

PAGE 1344

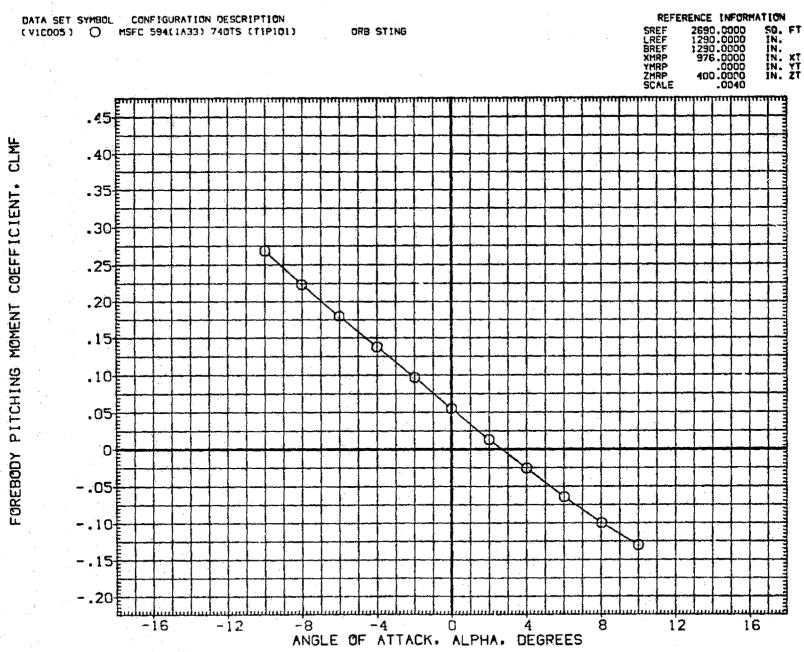
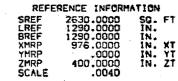


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG



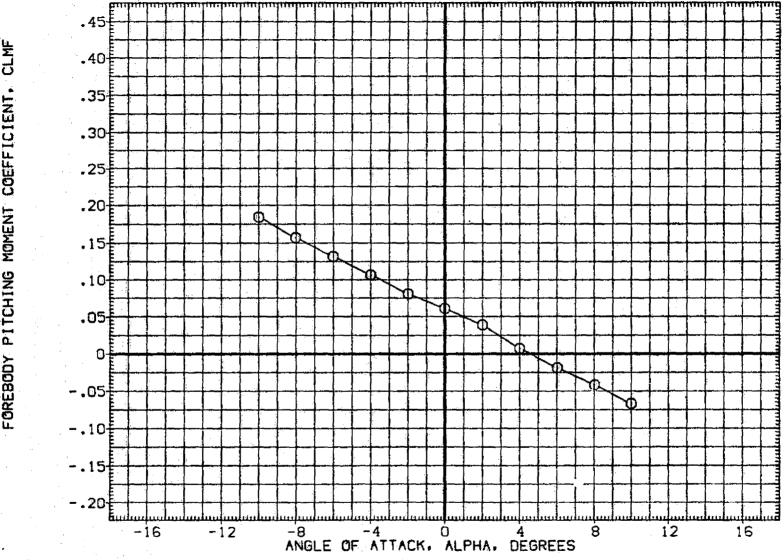


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS. BETA = 0 DEG

(F)MACH = 2.99

PAGE 1346

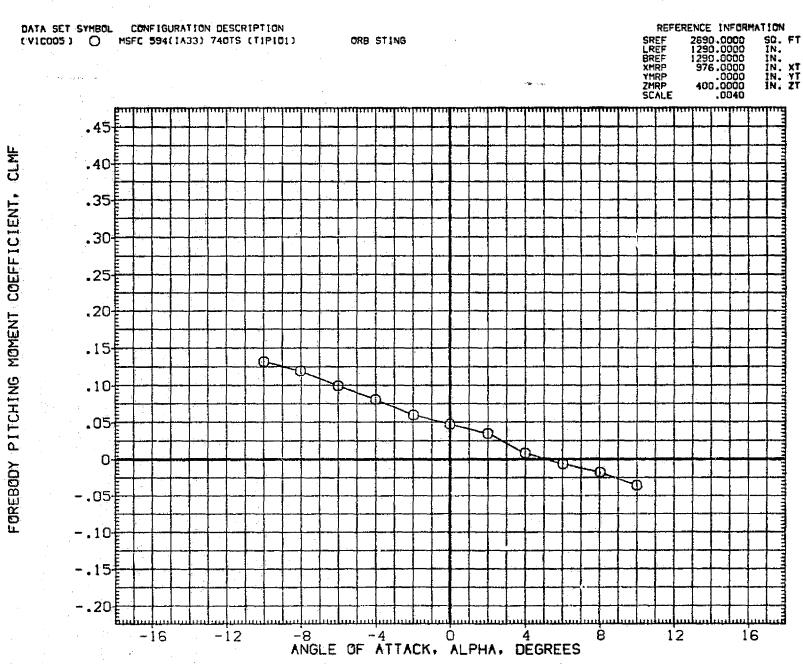
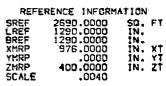


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS. BETA = 0 DEG

(G)MACH = 4.96

PAGE 1347



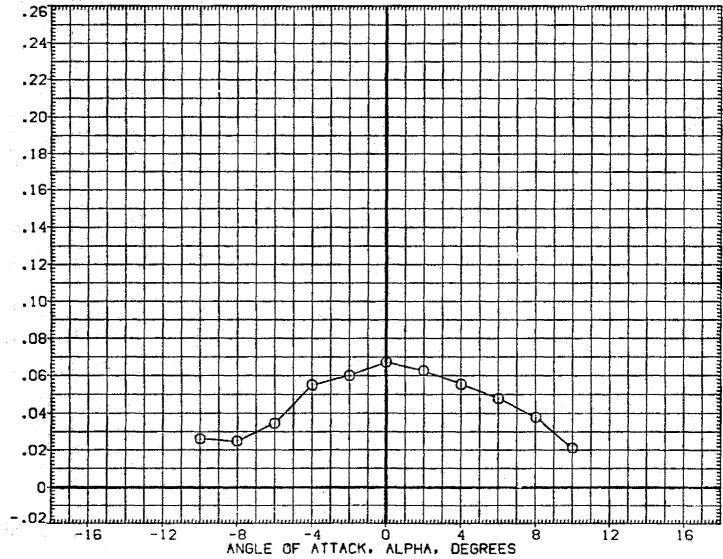


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(A)MACH = .60

PAGE 1348



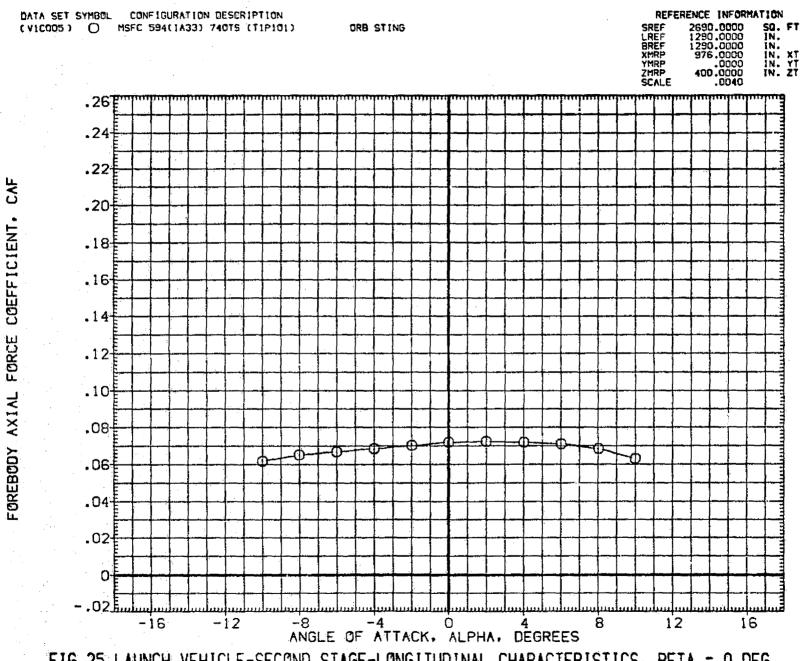
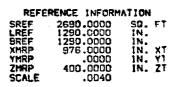


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG
(B)MACH = .90
PAGE 1349

FOREBODY



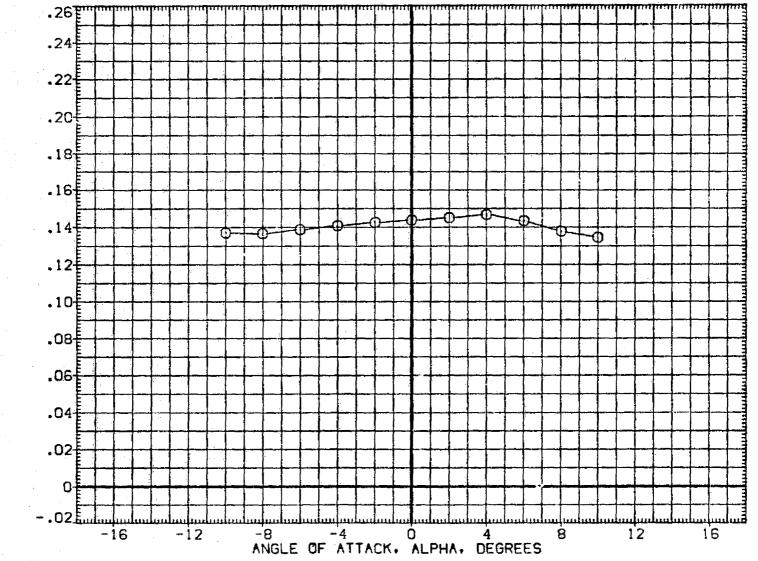


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(C)MACH = 1.10

PAGE 1350

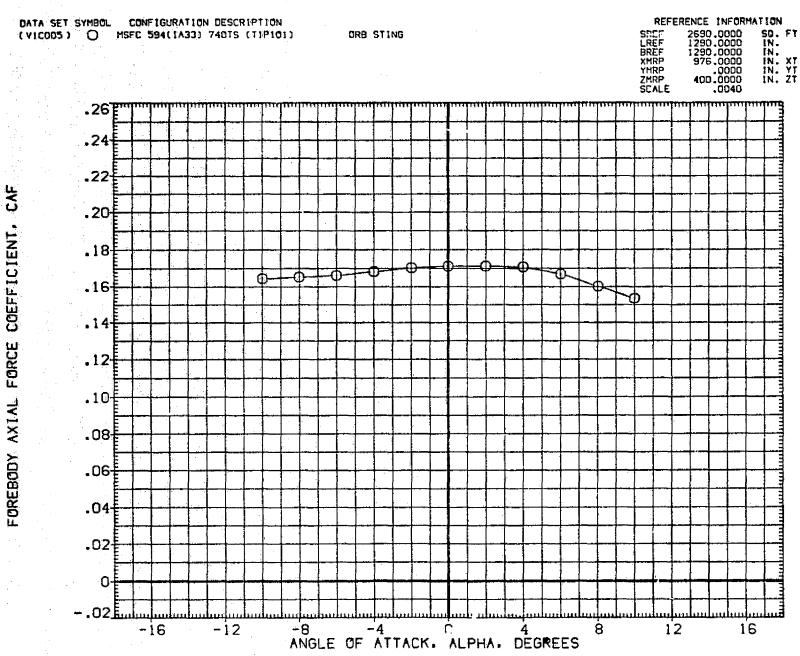
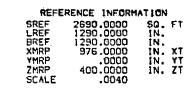


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(D)MACH = 1.25

PAGE 1351



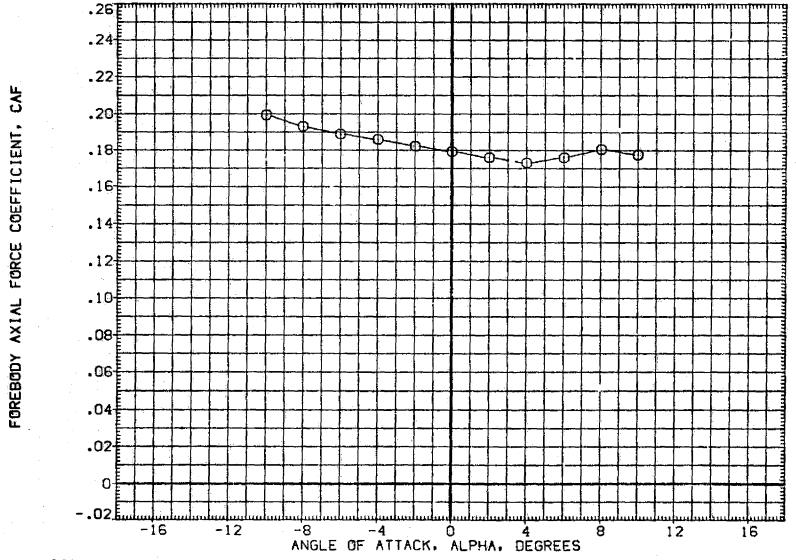


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG (E)MACH = 1.96



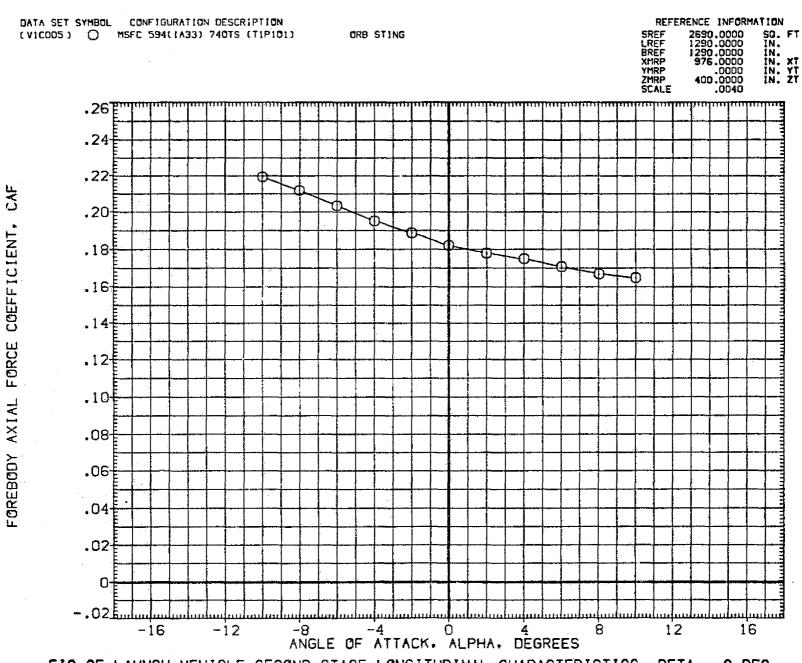


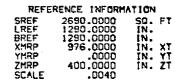
FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(F)MACH = 2.99

PAGE 1353

FORCE

FOREBOOY



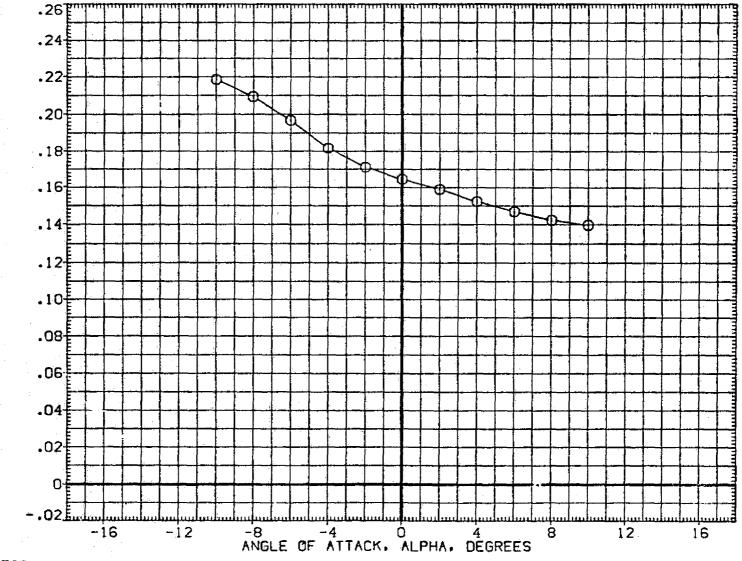
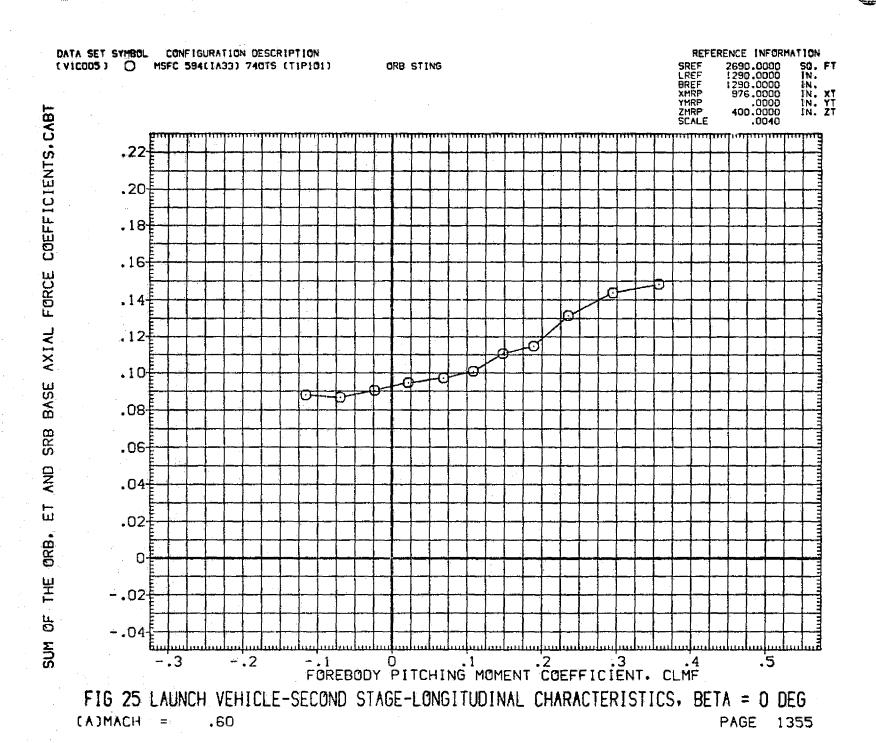


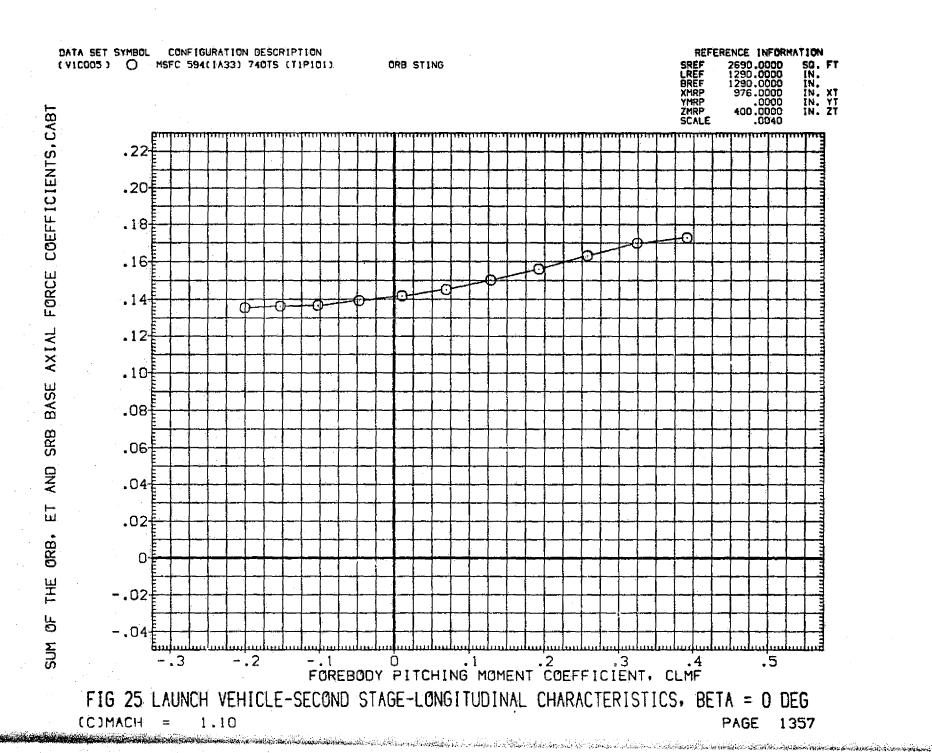
FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS. BETA = 0 DEG

(G)MACH = 4.96

PAGE 1354



(B)MACH = .90 PAGE 1356



(D)MACH = 1.25PAGE 1358

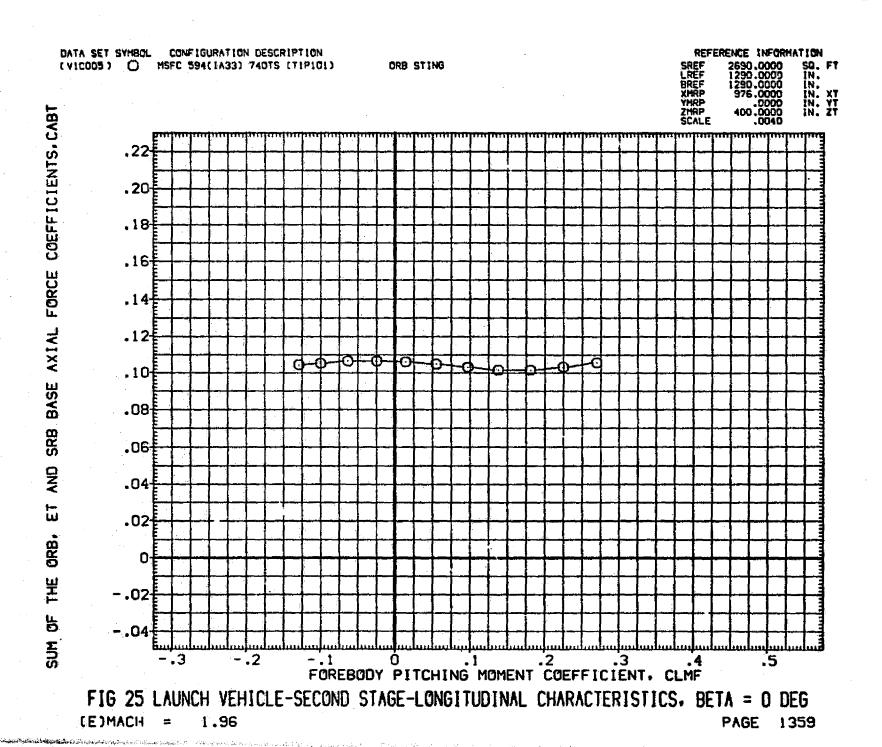


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(F)MACH = 2.99

PAGE 1360

-.1 0 1 .2 .3 .4 FOREBODY PITCHING MOMENT COEFFICIENT. CLMF

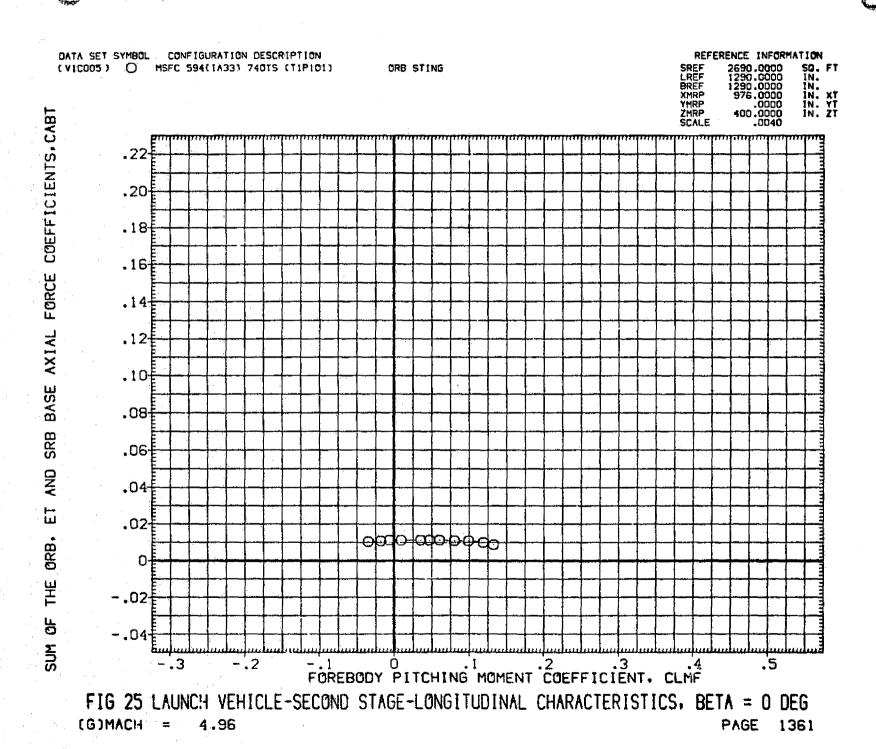


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS. BETA = 0 DEG
(A)MACH = .60
PAGE 1362

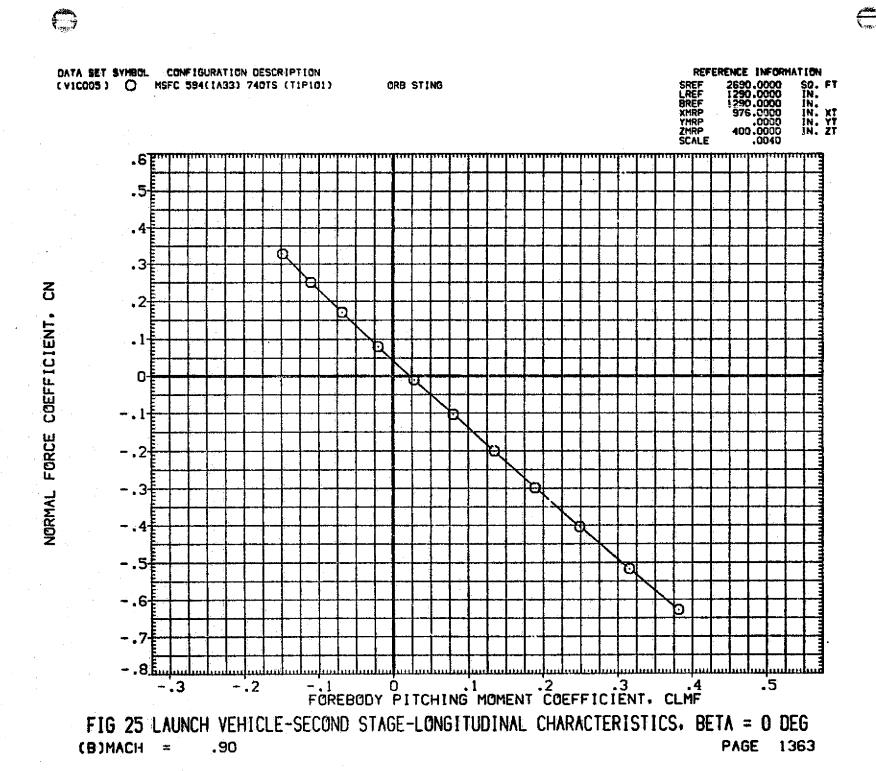


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG
(C)MACH = 1.10

PAGE 1364

FOREBODY PITCHING MOMENT COEFFICIENT, CLMF

.5



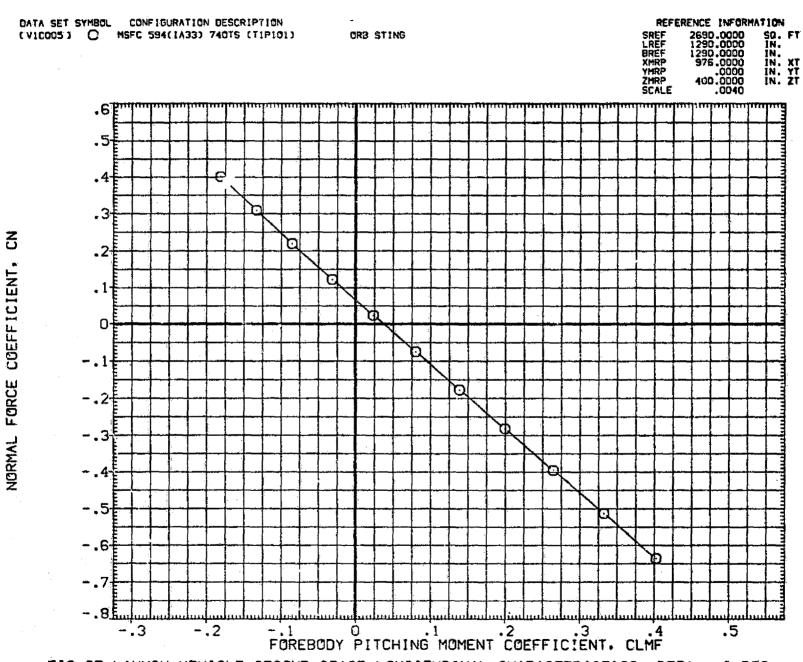


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS. BETA = 0 DEG

(D)MACH = 1.25

PAGE 1365

FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG
(E)MACH = 1.96
PAGE 1366

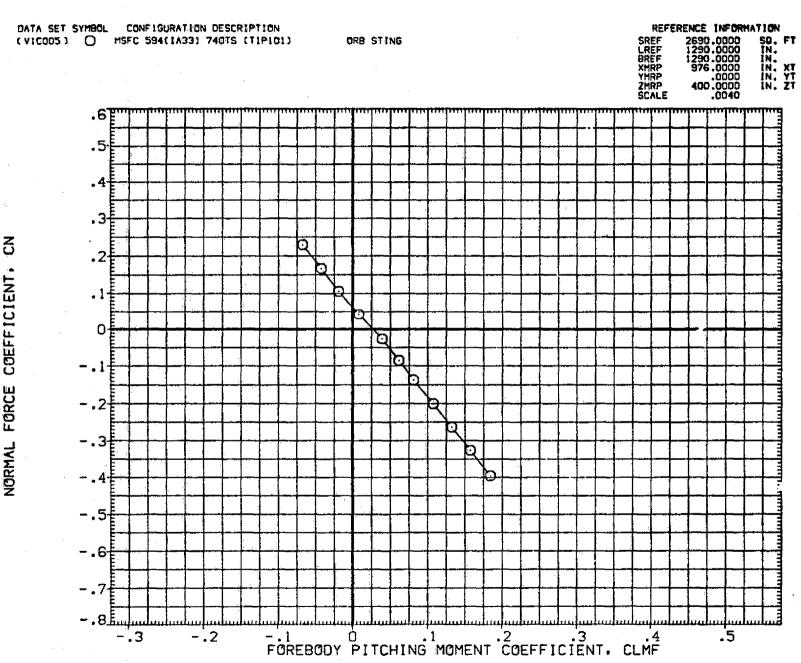
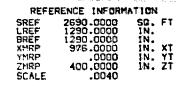


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(F)MACH = 2.99

PAGE 1367



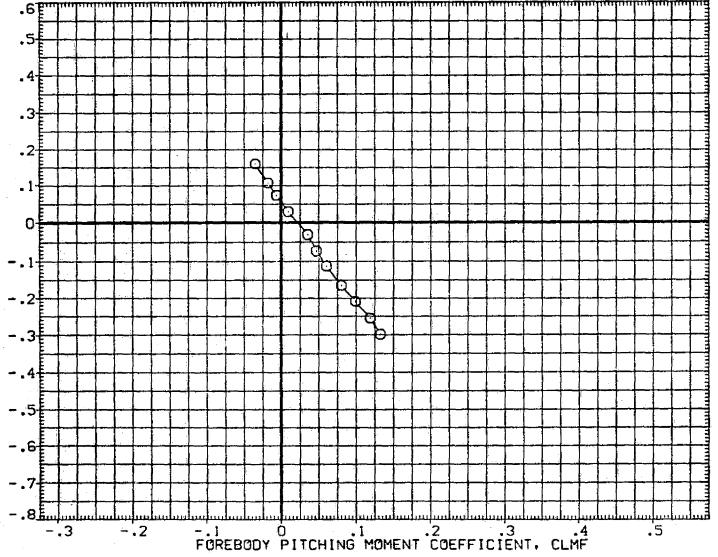


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(G)MACH = 4.96

PAGE 1368

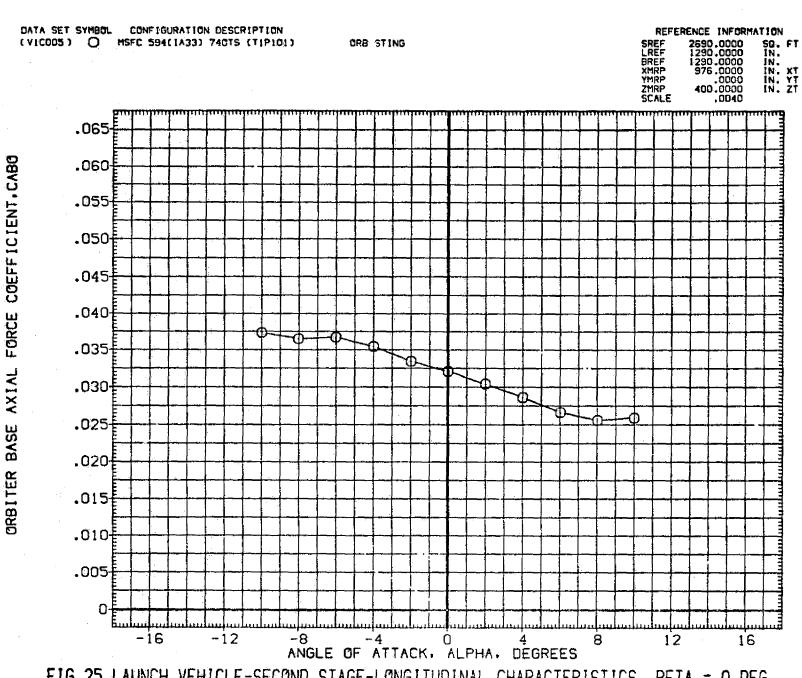
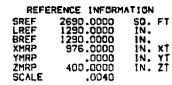


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(A)MACH = .60

PAGE 1369



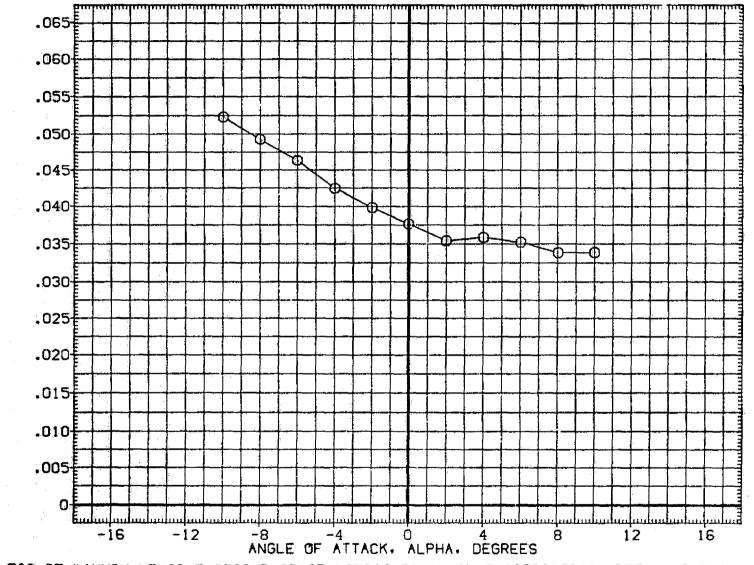


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(B)MACH = .90

PAGE 1370

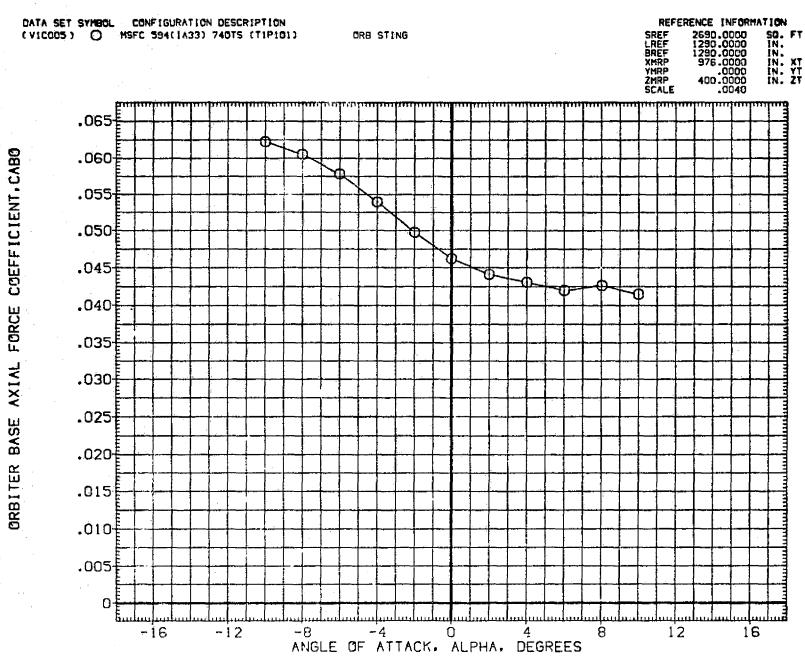
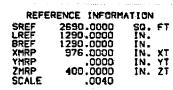


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG



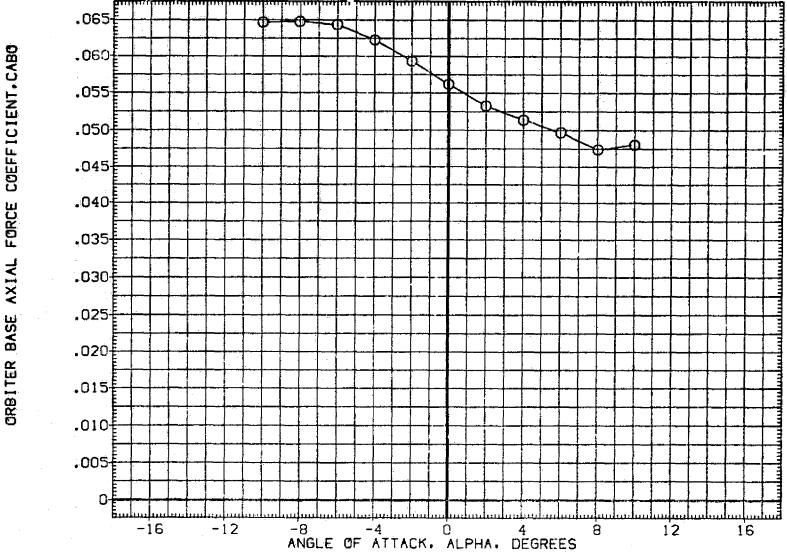


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(D)MACH = 1.25

PAGE 1372

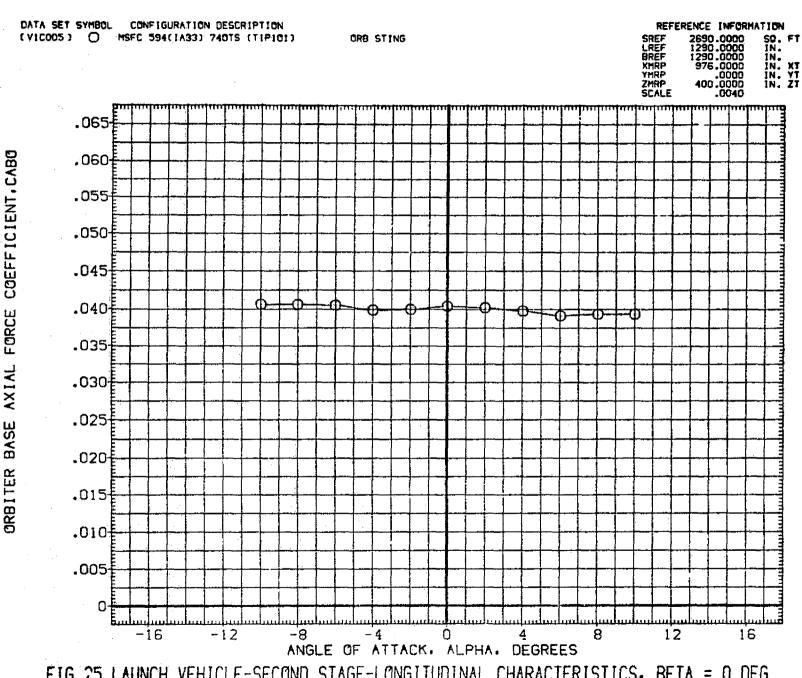


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

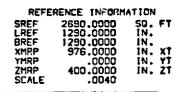
(E)MACH = 1.96

PAGE 1373

FORCE

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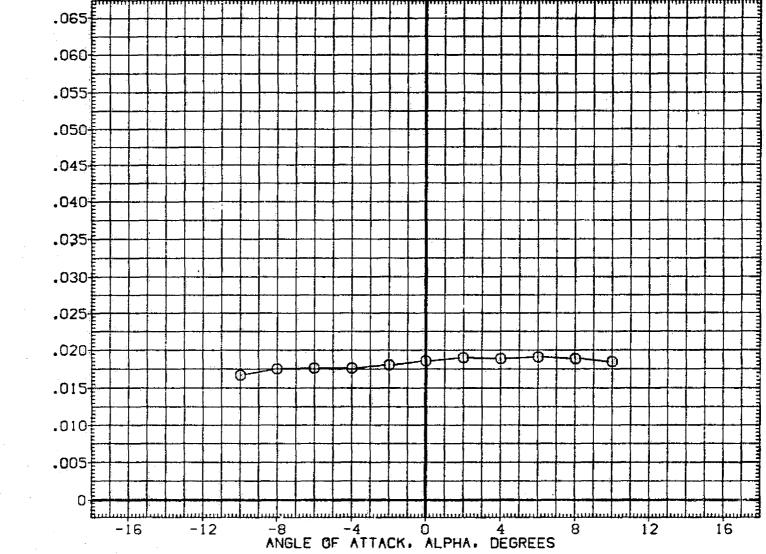


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG (F)MACH = 2.99PAGE 1374

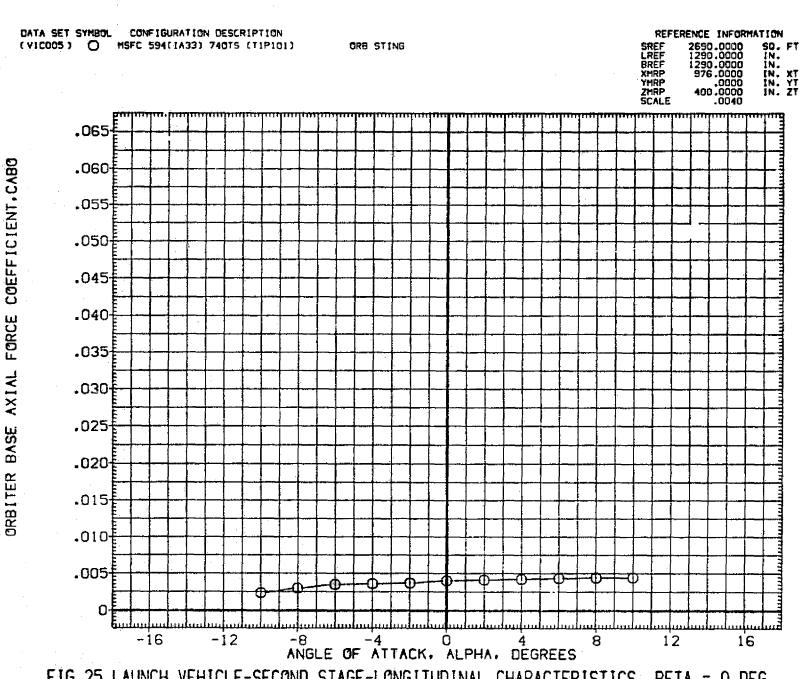


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(G)MACH = 4.96

PAGE 1375

(A)MACH =.60 PAGE 1376



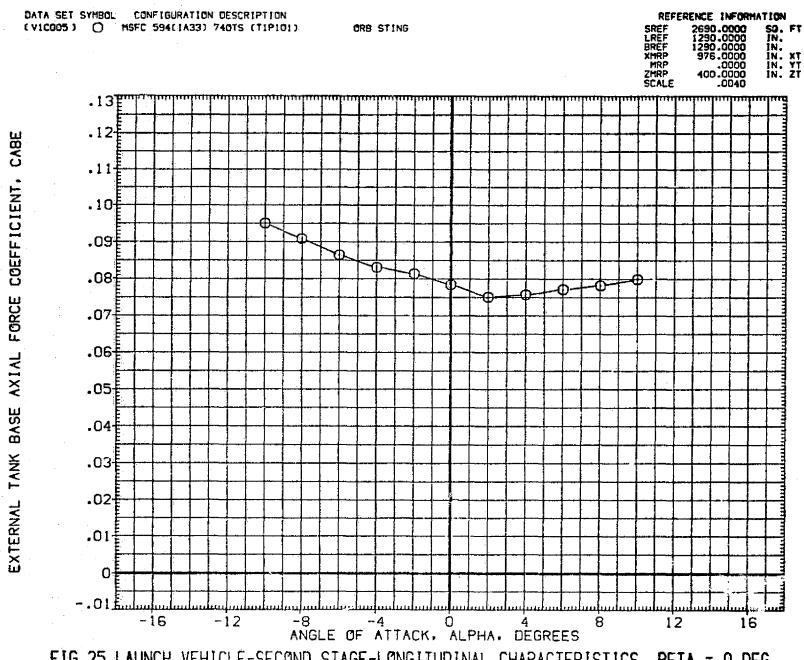


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(B)MACH = .90

PAGE 1377



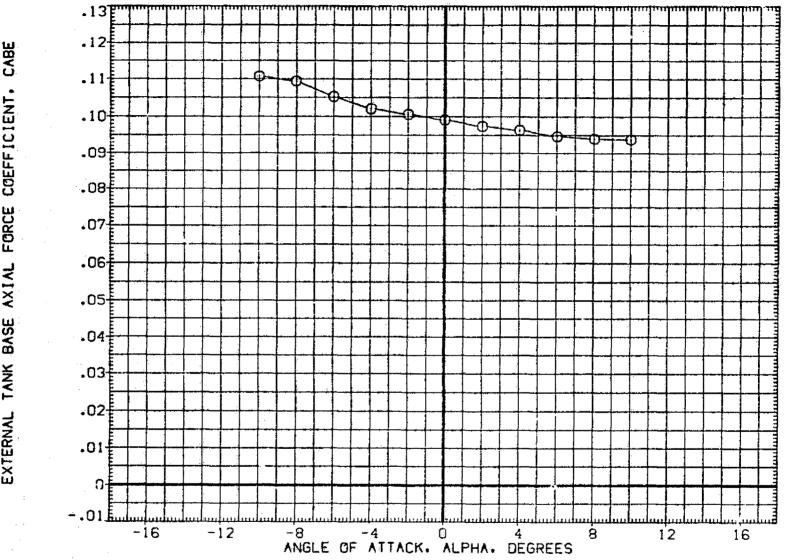


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(C)MACH = 1.10

PAGE 1378

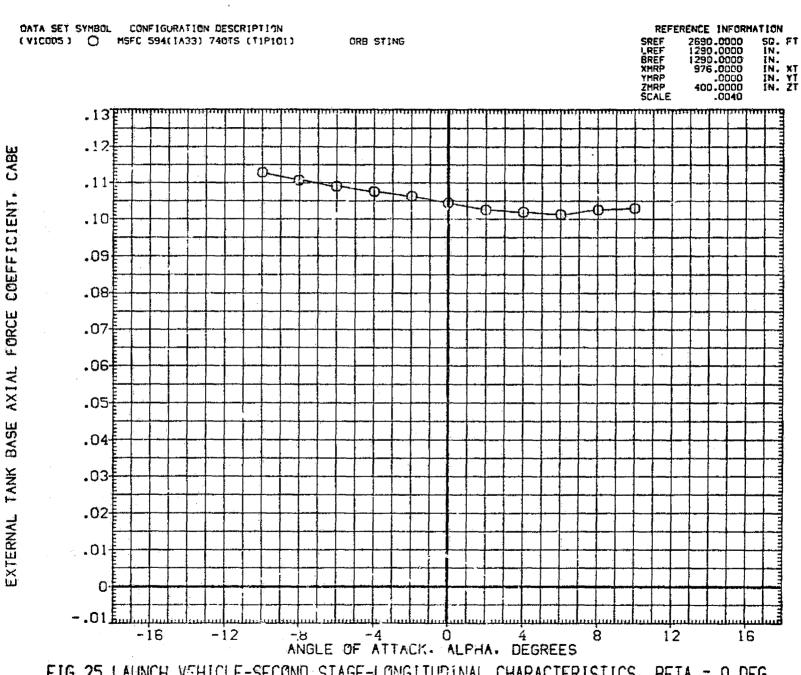


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(D)MACH = 1.25

PAGE 1379

(E)MACH = 1.96 PAGE 1380



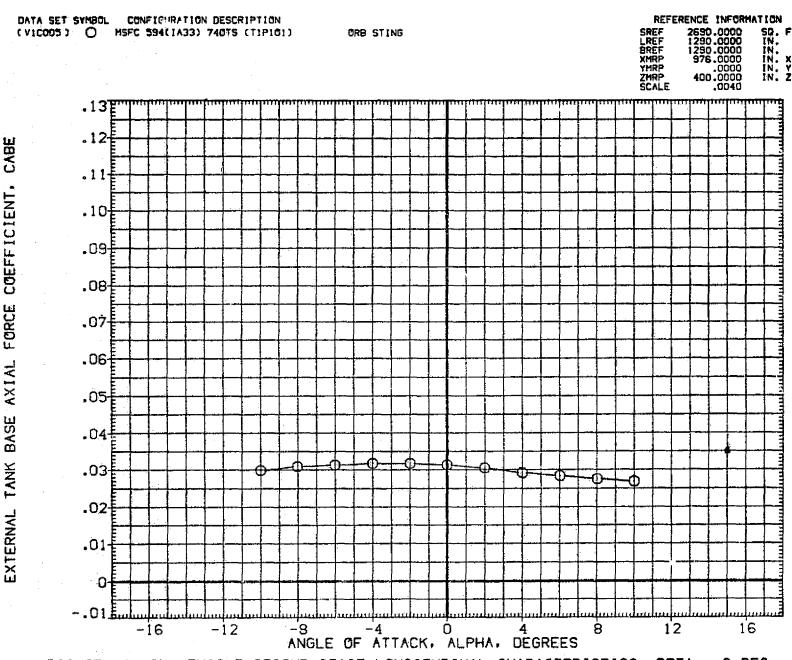


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(F)MACH = 2.99

PAGE 1381

FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(G)MACH = 4.96

PAGE 1382

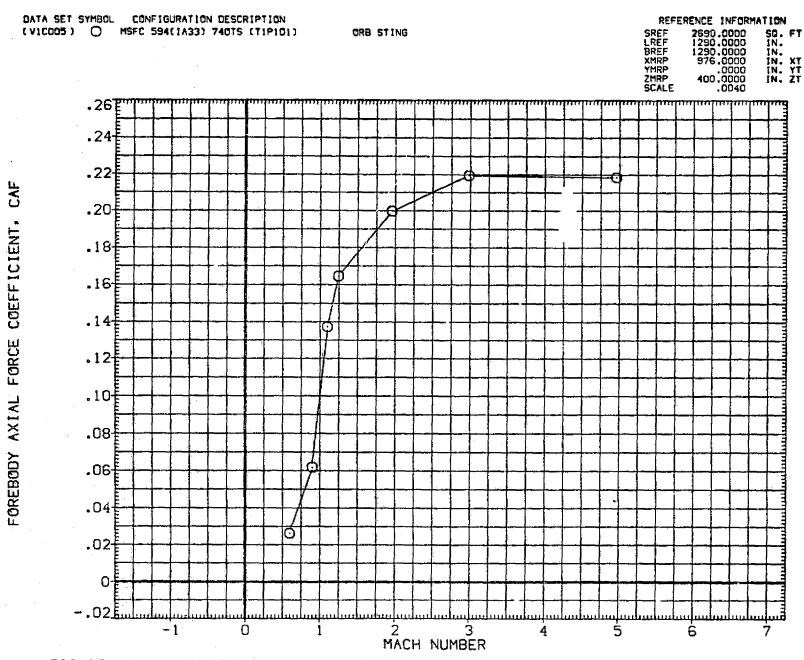
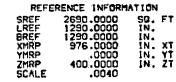


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(A)ALPHA = -10.00

FAGE 1383



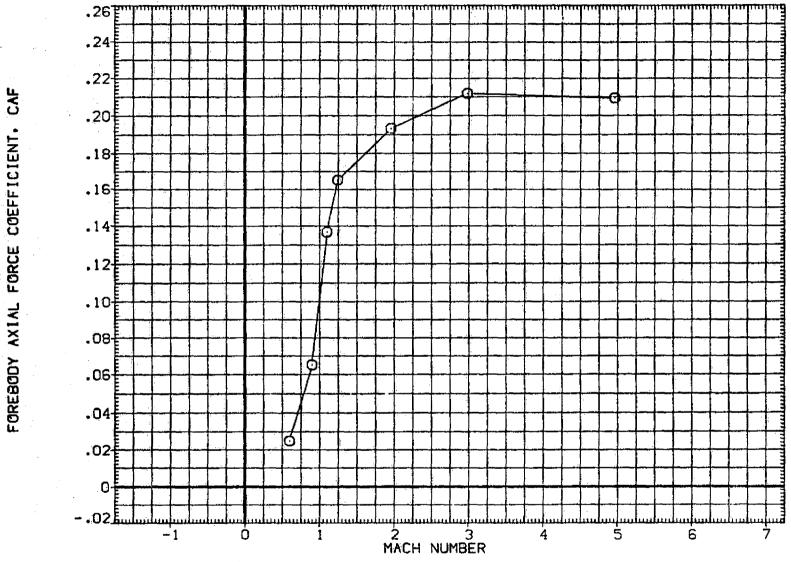
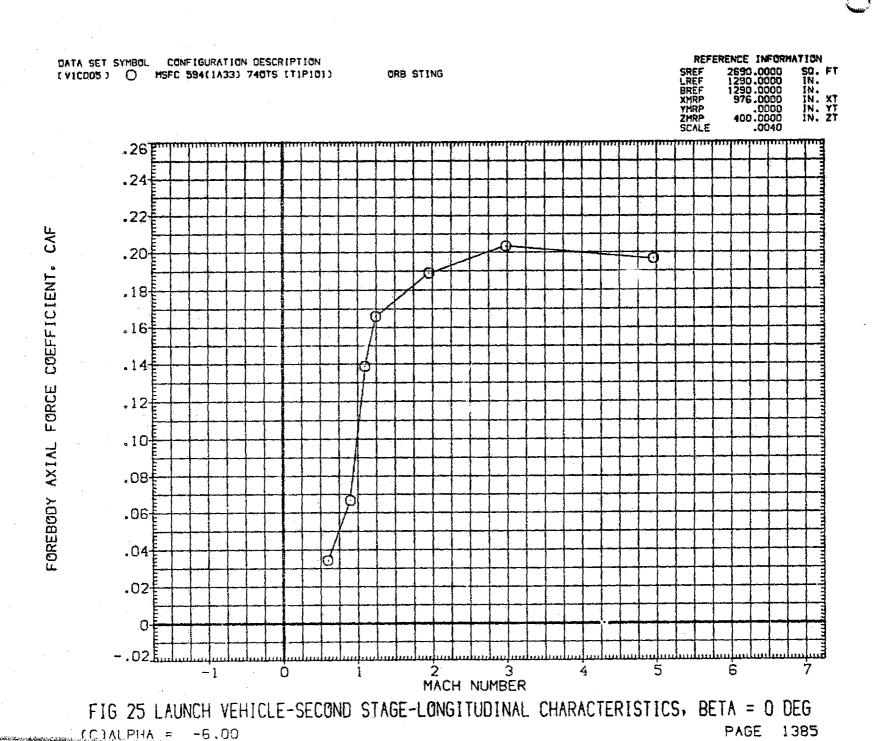


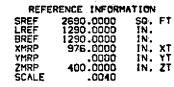
FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(B)ALPHA = -8.00

PAGE 1384



COEFFICIENT,



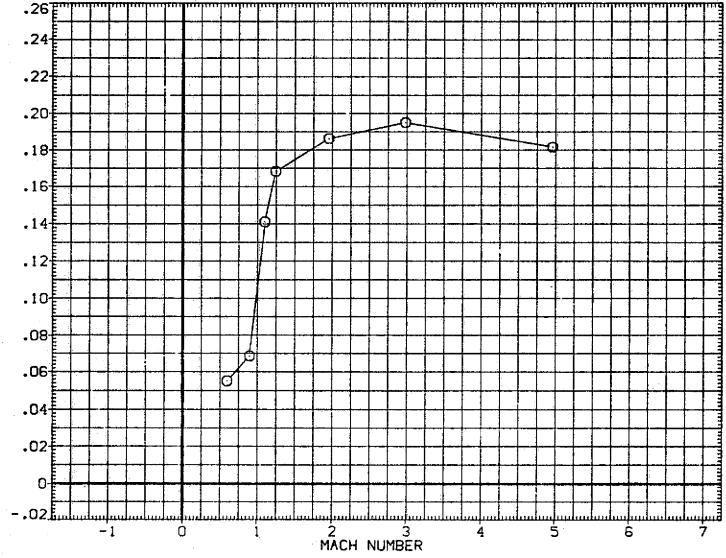


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(D)ALPHA = -4.00

PAGE 1386

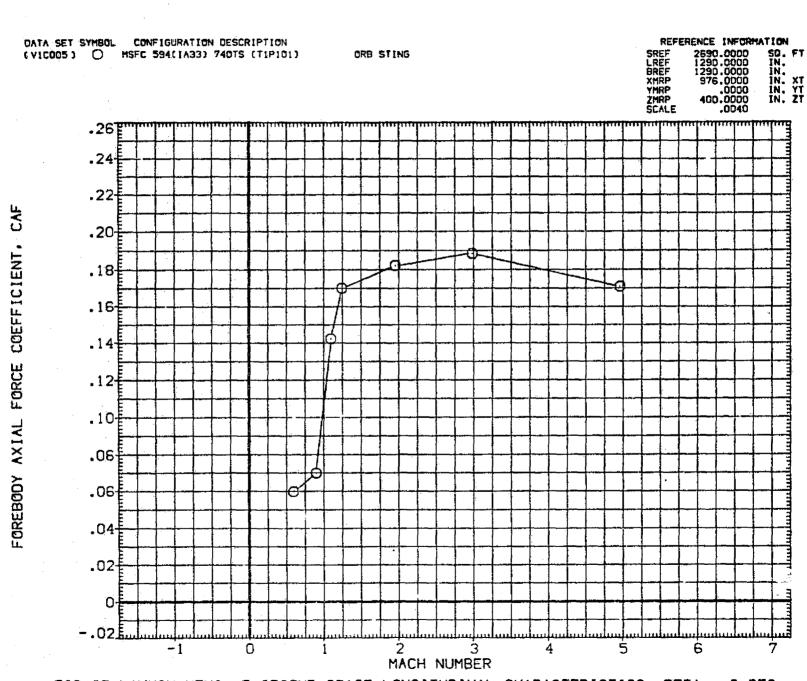


FIG 25 LAUNCH VEHILLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG (E)ALPHA = -2.00 PAGE 1387

FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(F)ALPHA = .00

PAGE 1388



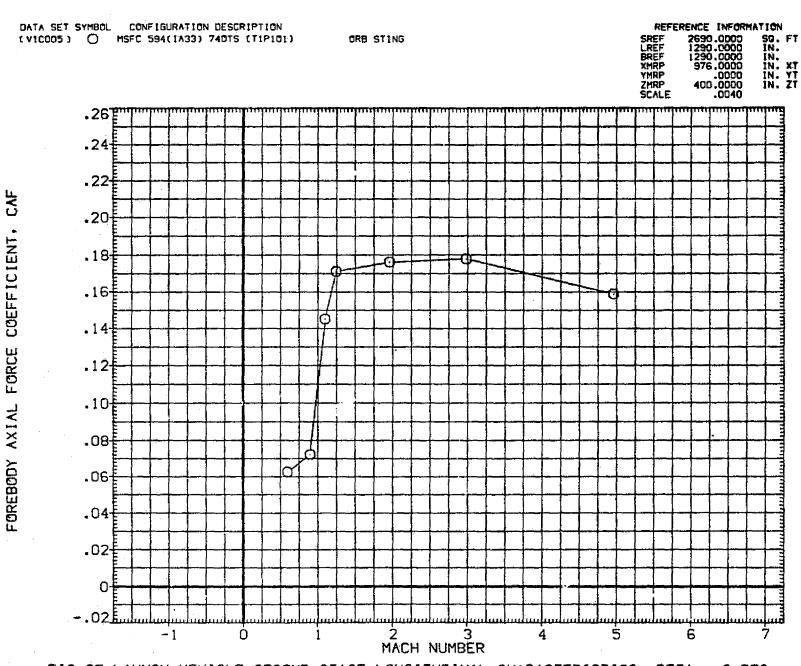
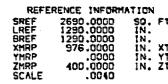


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(G)ALPHA = 2.00 PAGE 1389

FOREBOOY



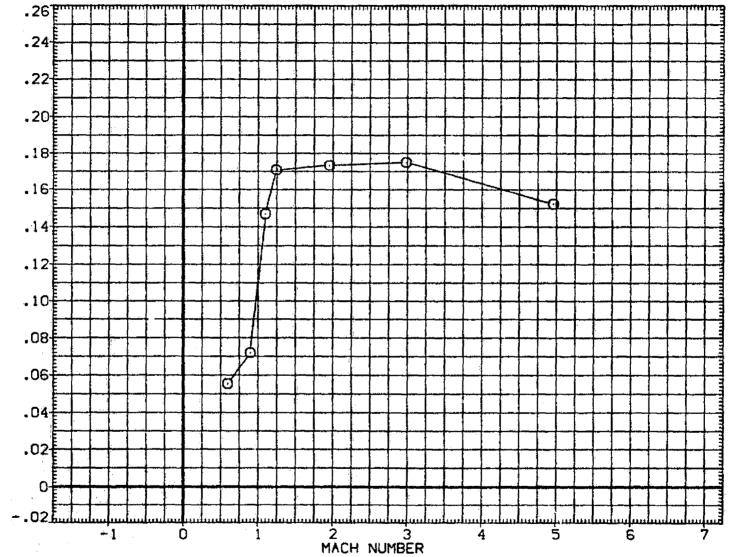


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(H)ALPHA = 4.00

PAGE 1390

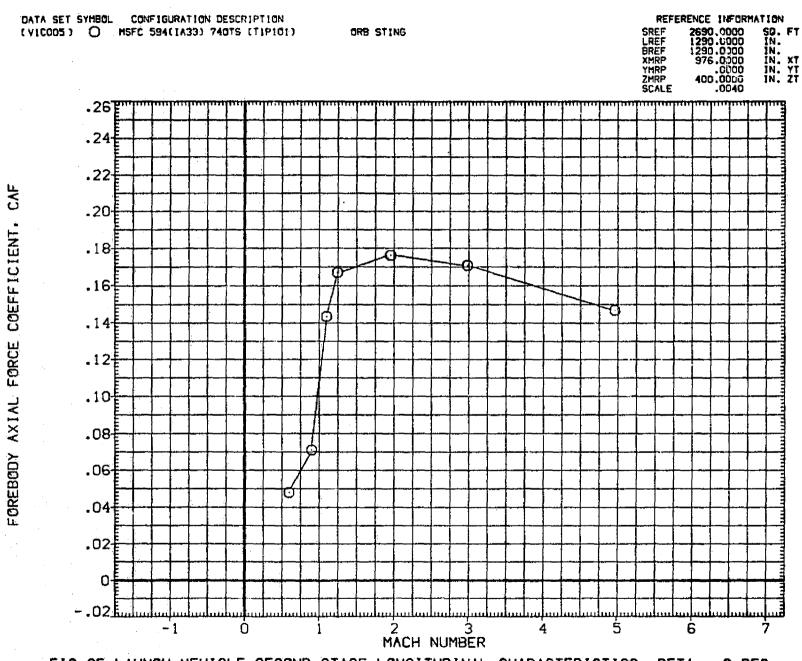
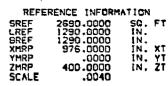


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG
(I)ALPHA = 6.00
PAGE 1391

COEFF ICIENT

FOREBODY



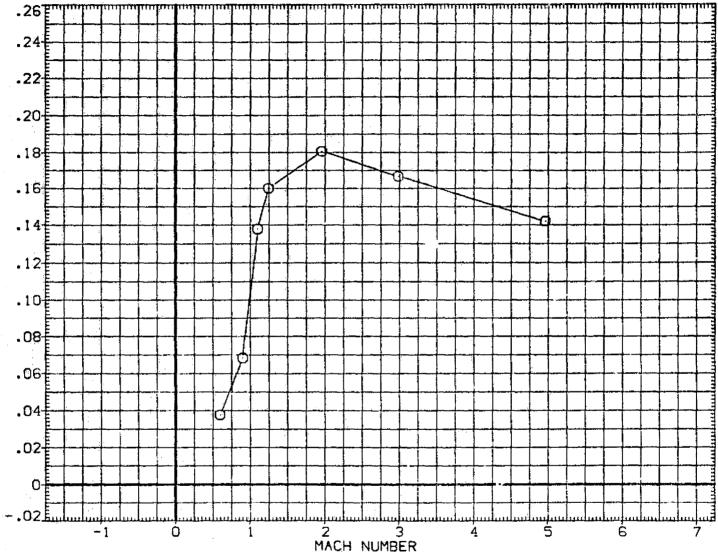


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS. BETA = 0 DEG

(J)ALPHA = 8.00 PAGE 1392



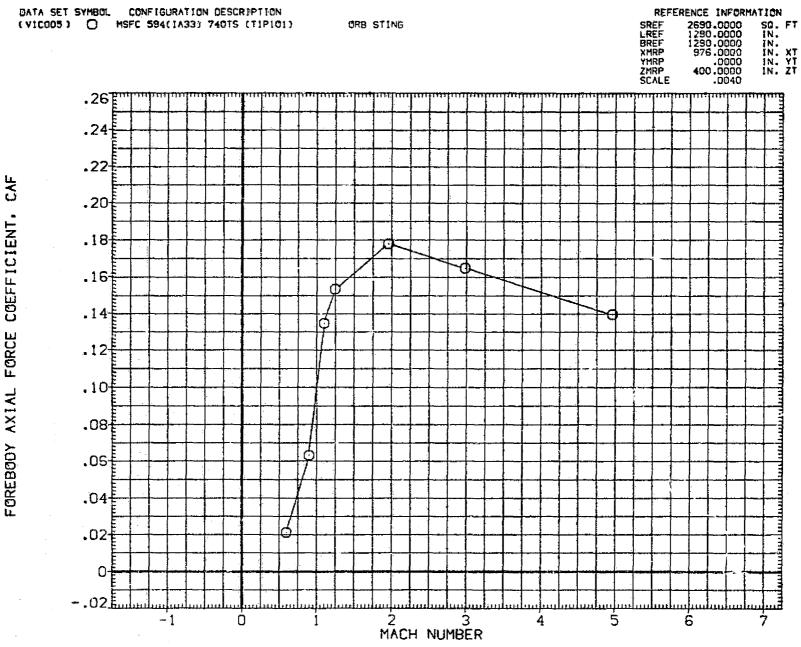


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG
(K)ALPHA = 10.00 PAGE 1393

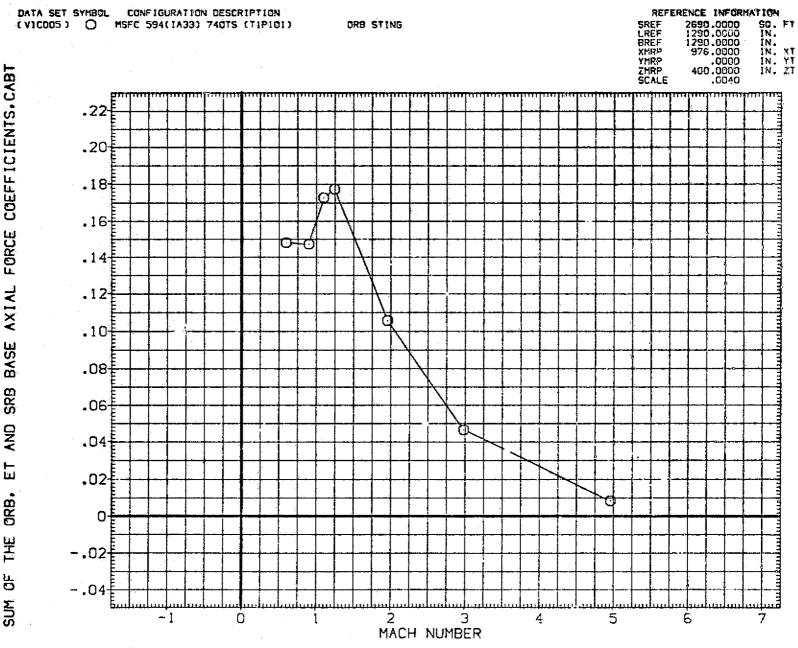


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG
(A)ALPHA = -10.00
PAGE 1384

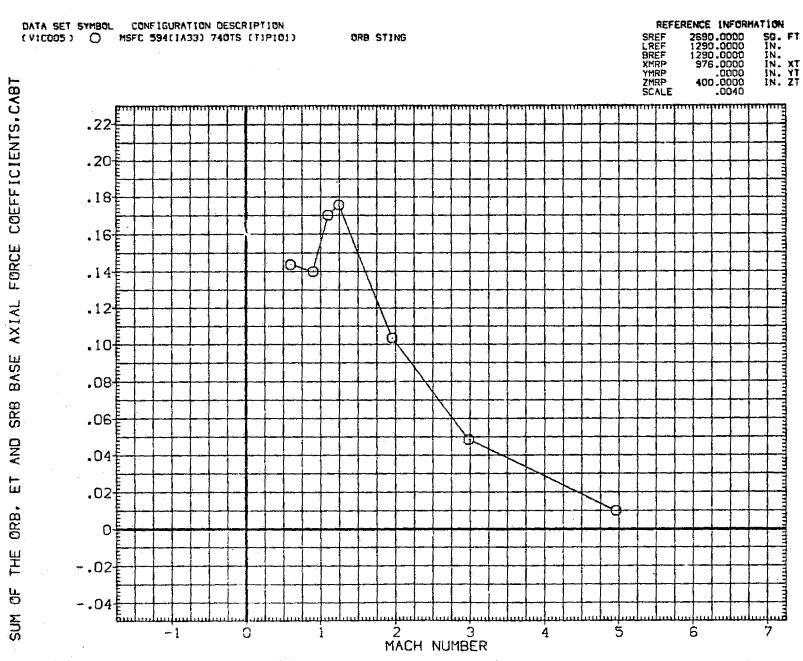


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(B)ALPHA = -8.00

PAGE 1395

FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG
(C)ALPHA = -6.00

PAGE 1396

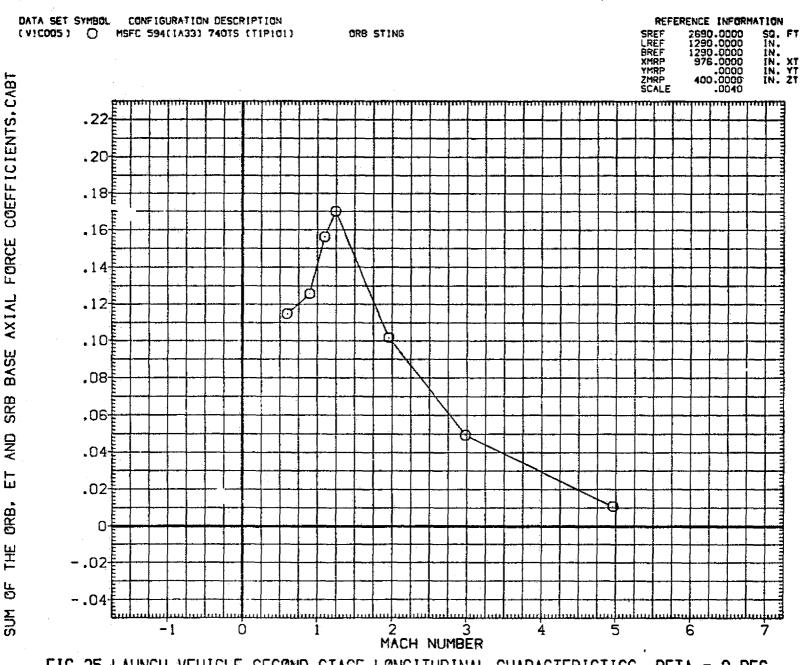


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG
(D)ALPHA = -4.00

PAGE 1397

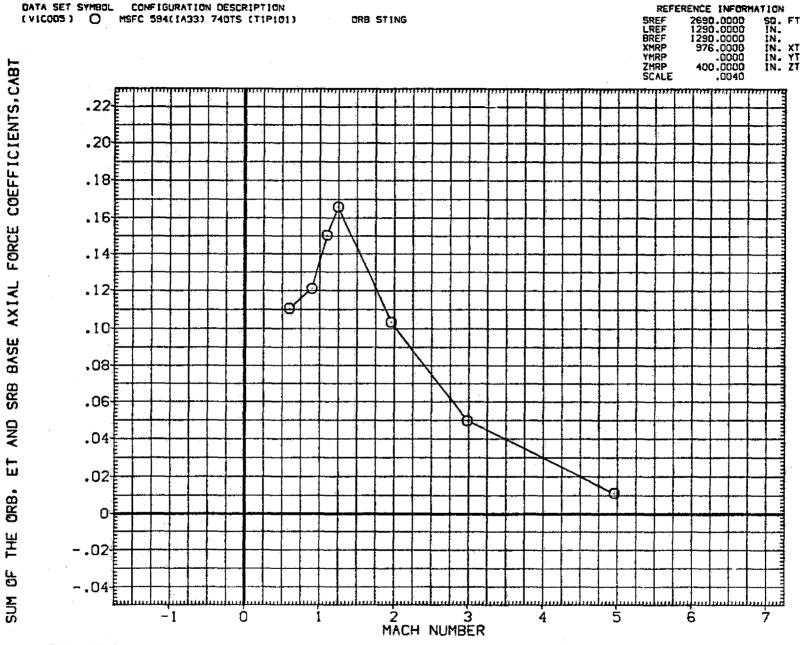


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS. BETA = 0 DEG

(E)ALPHA = -2.00

PAGE 1398

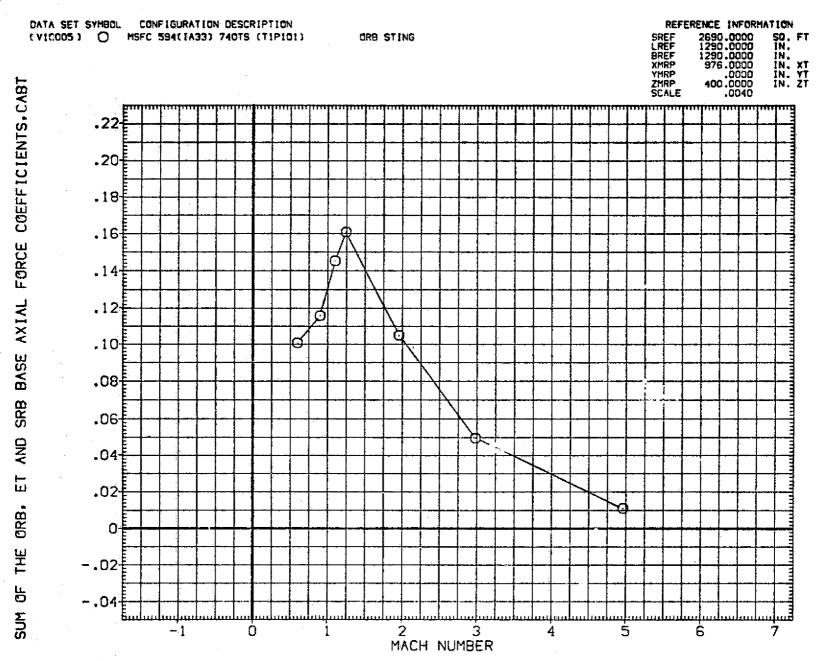


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(F)ALPHA = .00 PAGE 1399

FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG
(G)ALPHA = 2.00
PAGE 1400

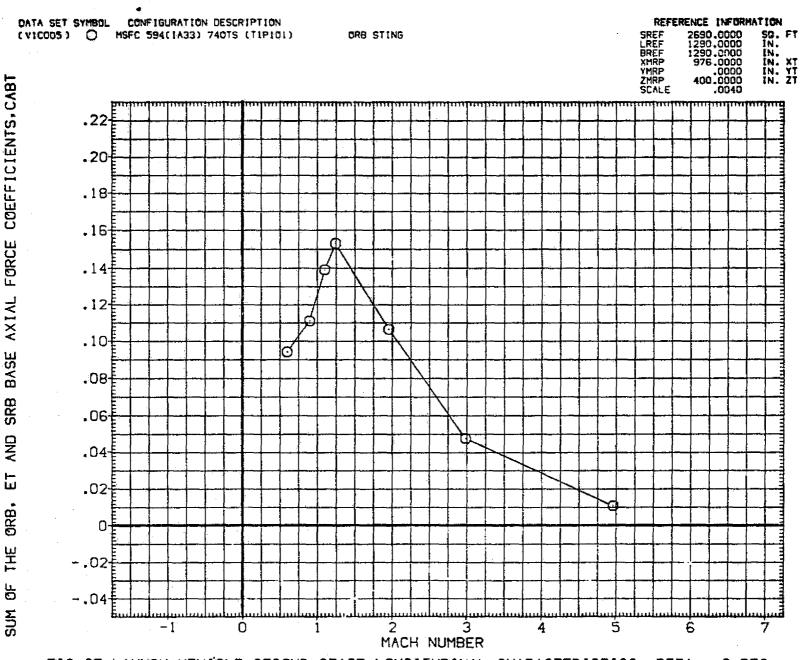


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(H)ALPHA = 4.00

PAGE 1401

FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

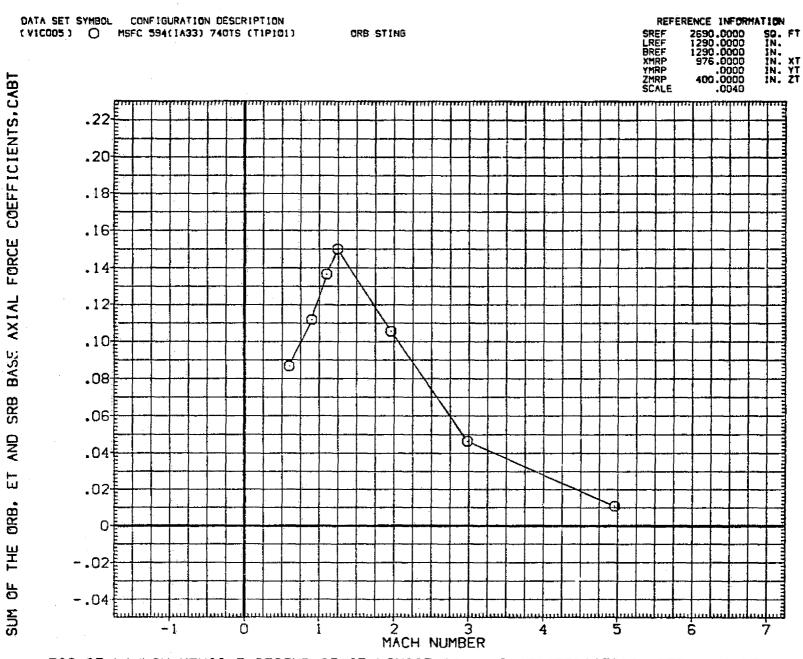


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS. BETA = 0 DEG

(J)ALPHA = 8.00

PAGE 1403

FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG
(K)ALPHA = 10.00 PAGE 1404

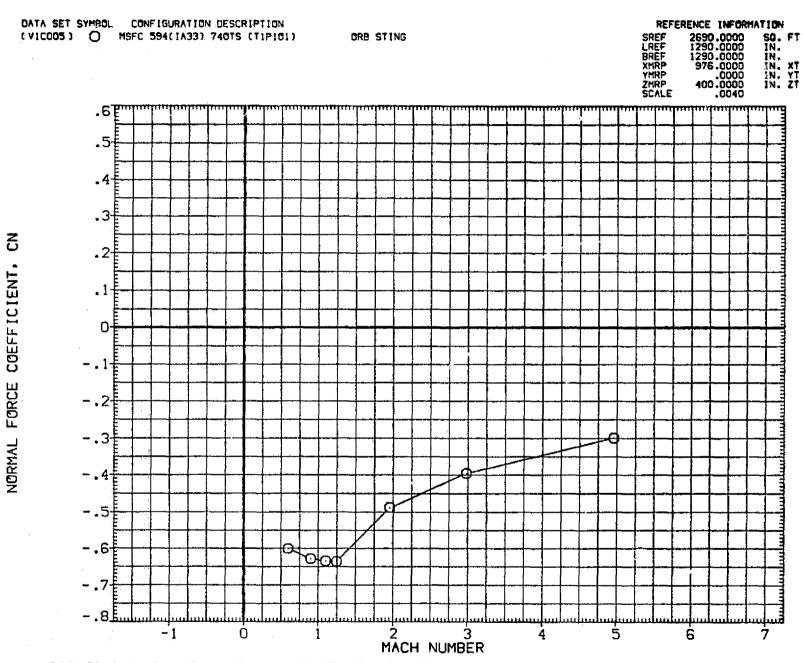


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(A) ALPHA = -10.00

PAGE 1405

COEFFICIENT,

NORMAL FORCE

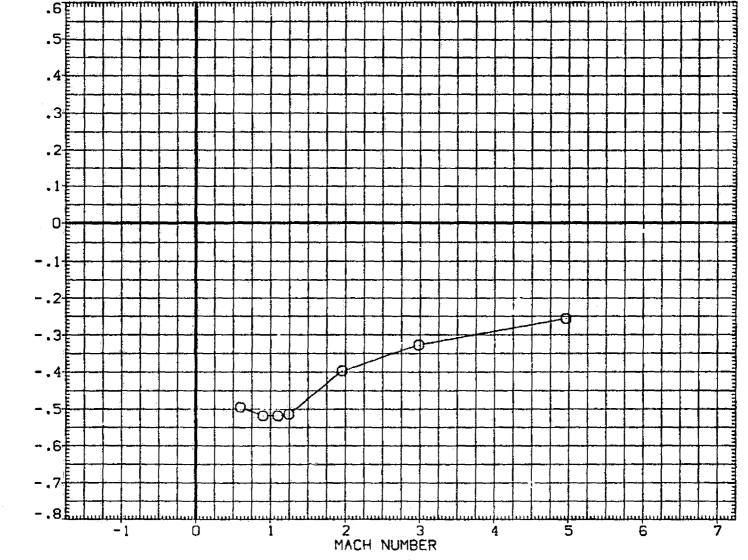


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(B)ALPHA = -8.00

PAGE 1406

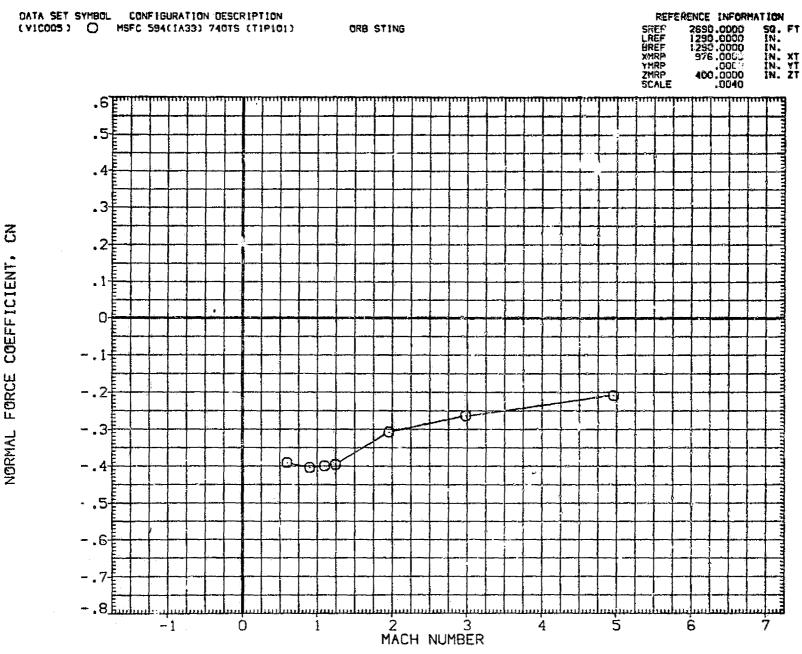


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG
(C)ALPHA = -6.00
PAGE 1407

NORMAL FORCE COEFFICIENT,

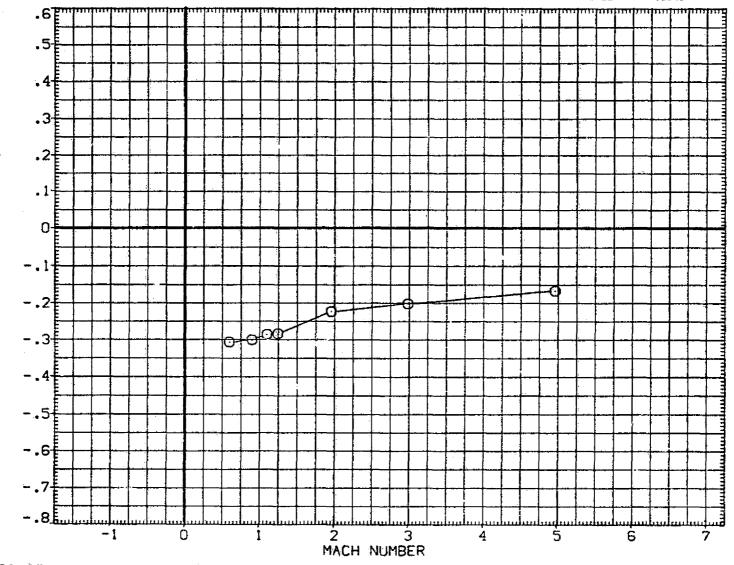


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(D)ALPHA = -4.00

PAGE 1408

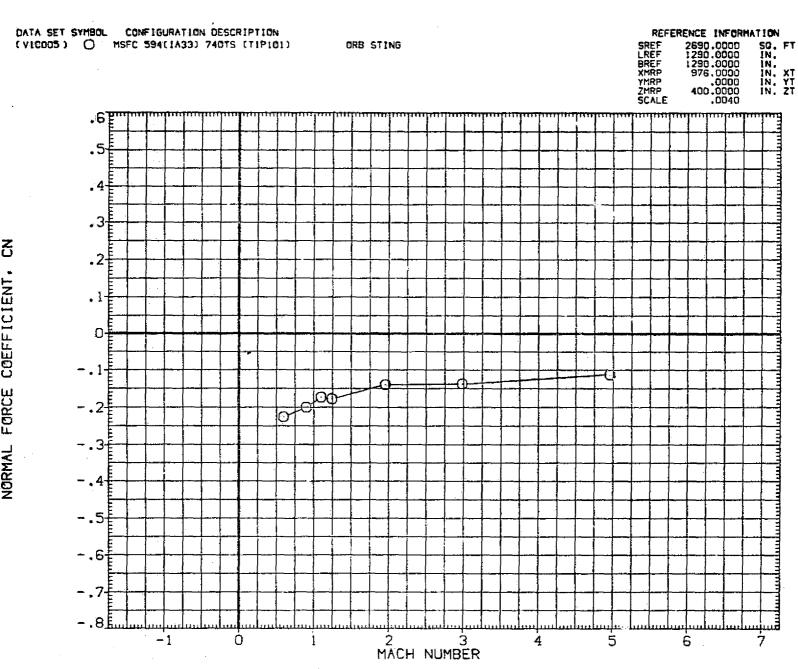
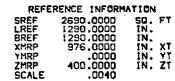


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(E)ALPHA = -2.00

PAGE 1409



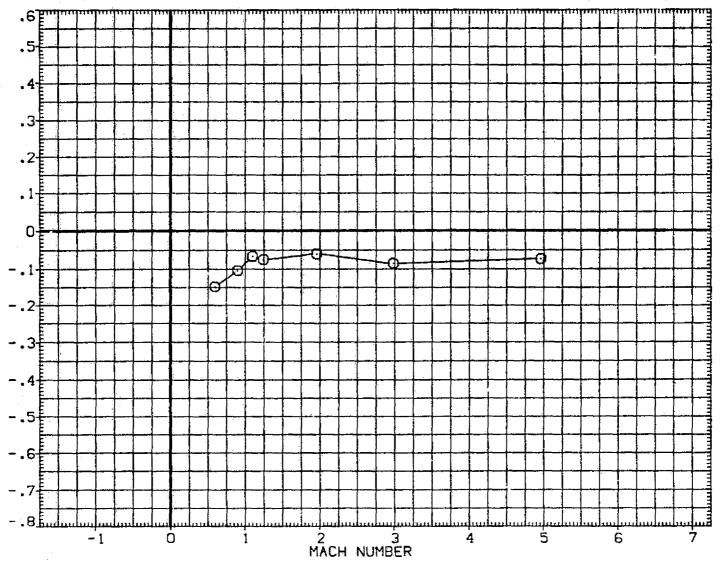


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(F)ALPHA = .00

PAGE 1410

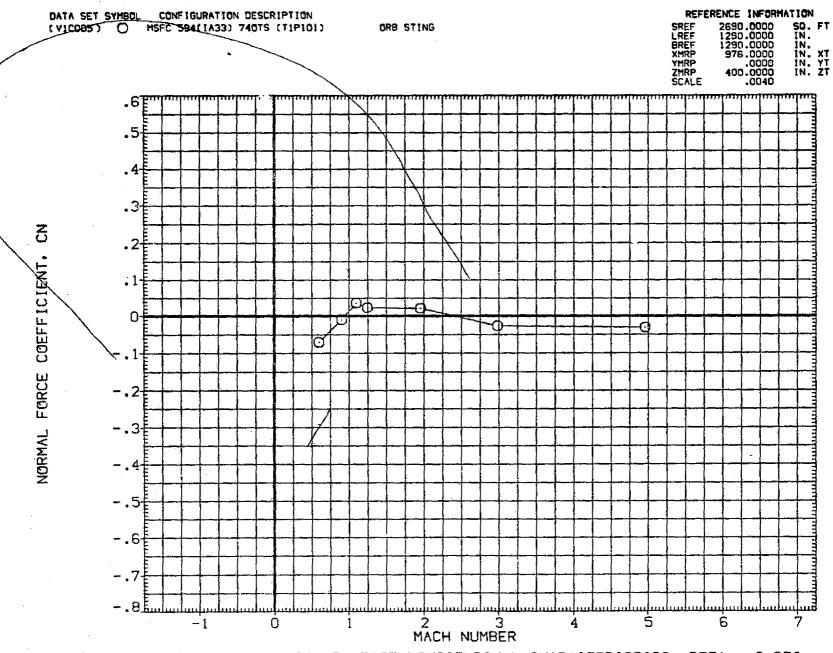
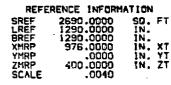


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(G)ALPHA = 2.00 PAGE 1411



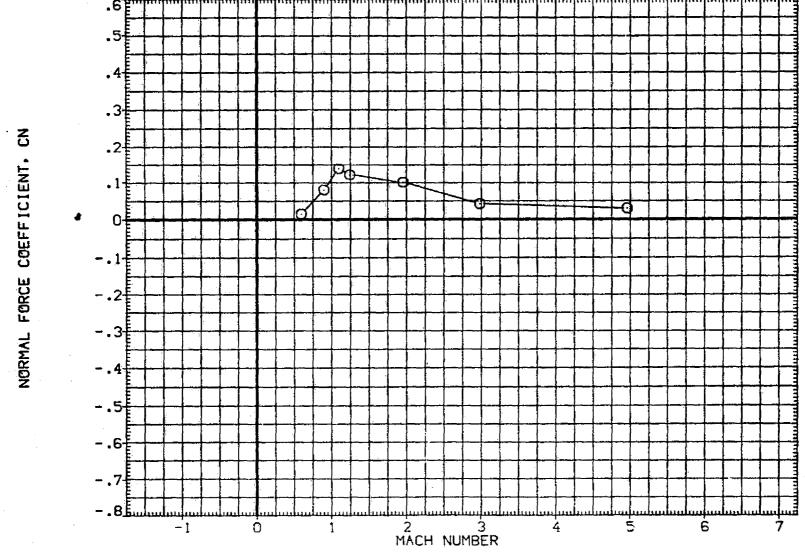


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS. BETA = 0 DEG (H)ALPHA = 4.00PAGE 1412

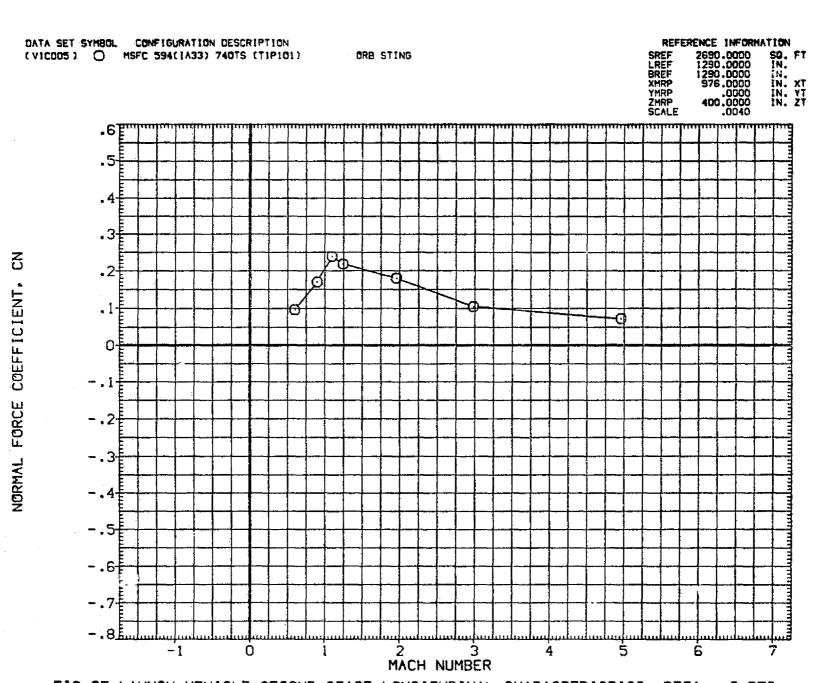


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG
(1)ALPHA = 6.00
PAGE 1413

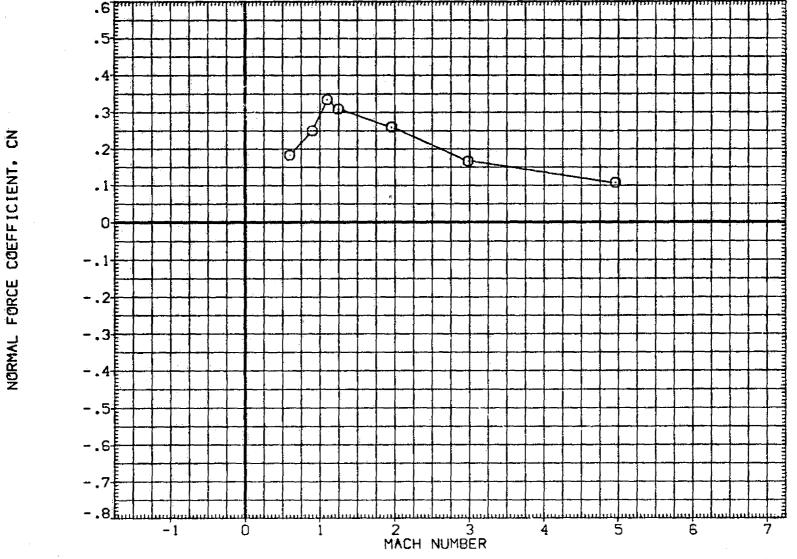


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(J)ALPHA = 8.00

PAGE 1414

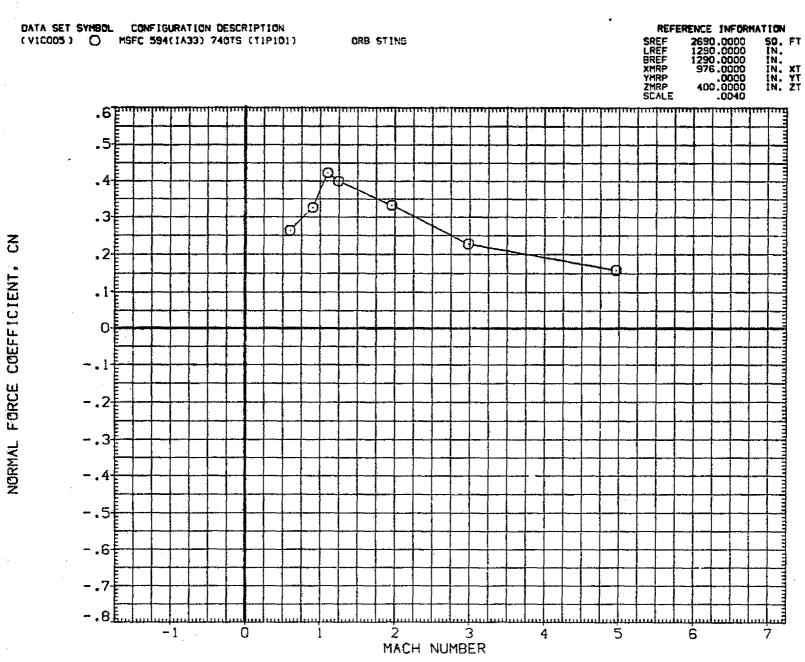


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(K)ALPHA = 10.00

PAGE 1415

FOREBODY

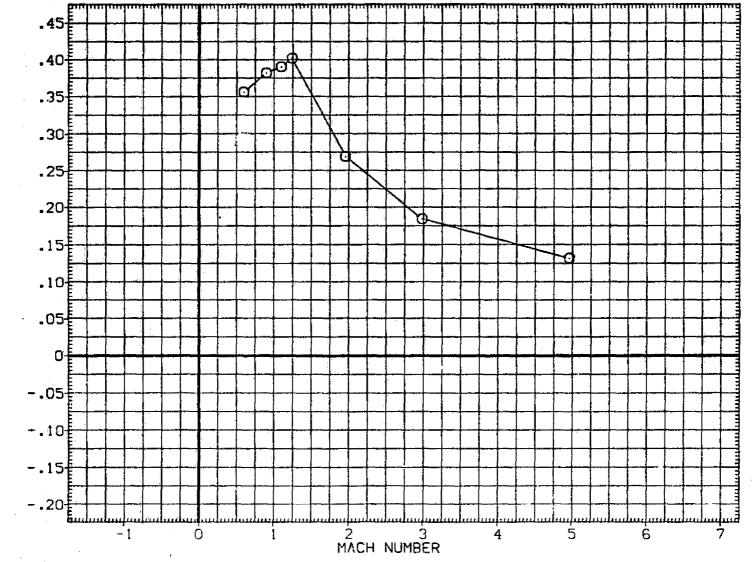


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

[A]ALPHA = -10.00

PAGE 1416

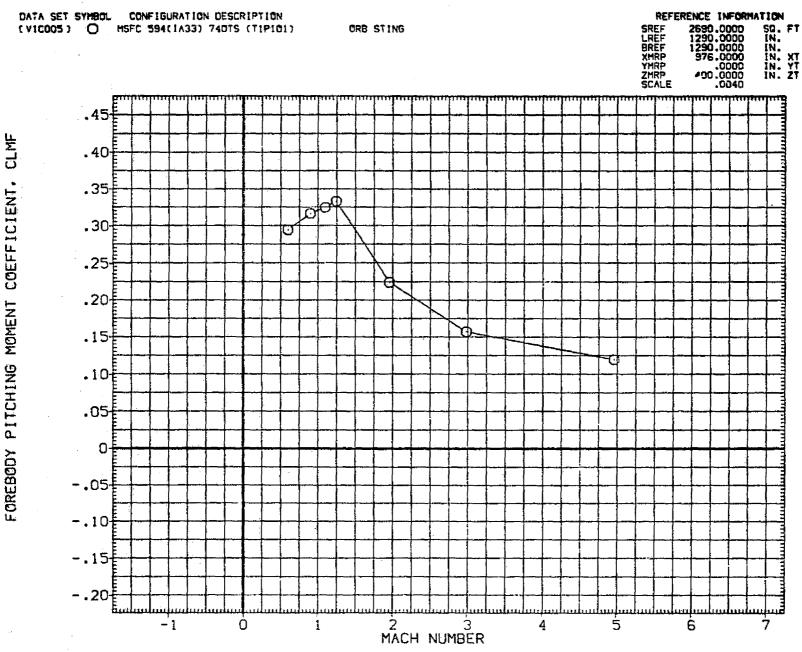


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(B)ALPHA = -8.00

PAGE 1417

PITCHING MOMENT COEFFICIENT.

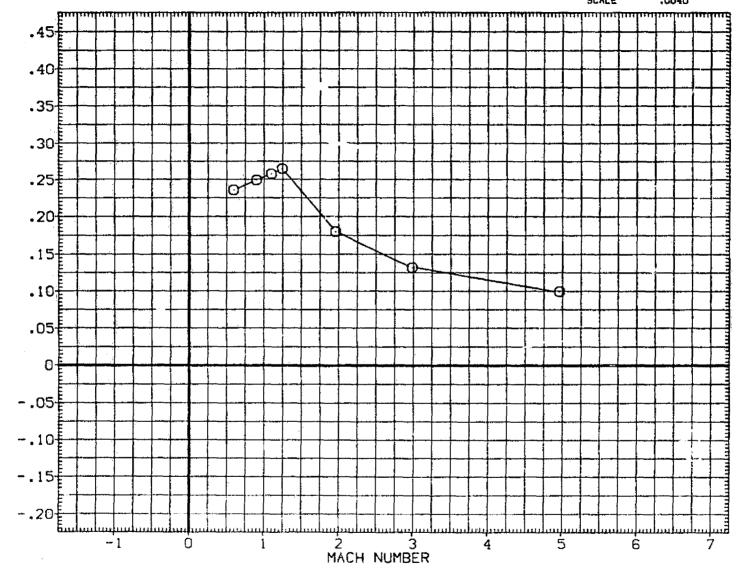


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG
(C)ALPHA = -6.00

PAGE 1418

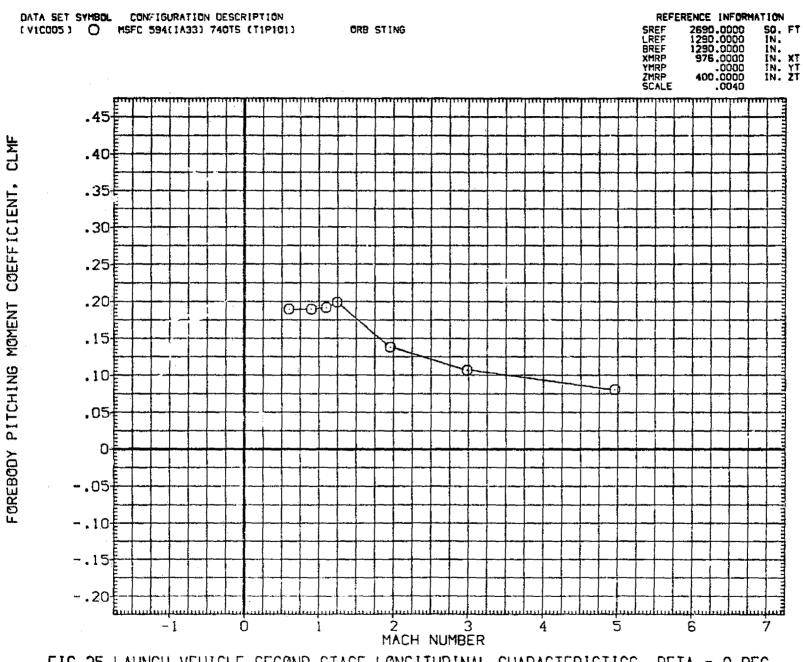


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(D)ALPHA = -4.00

PAGE 1419

FOREBODY PITCHING MOMENT COEFFICIENT,

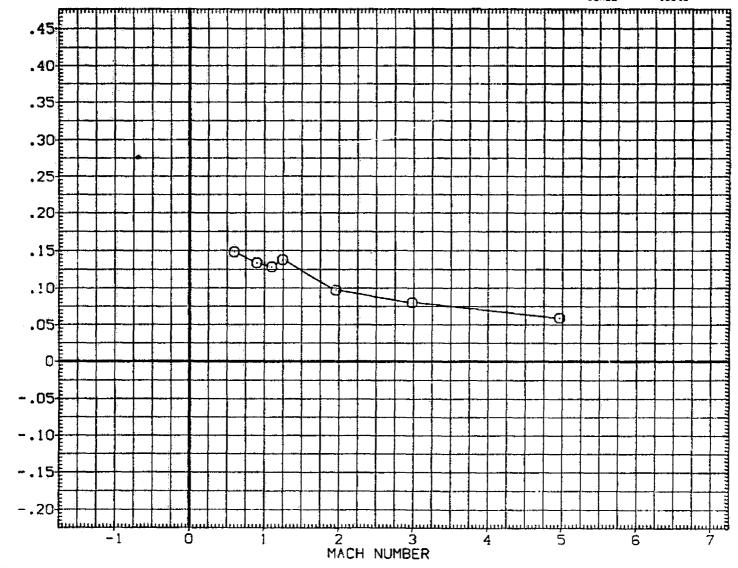


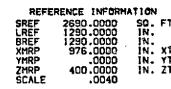
FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(E)ALPHA = -2.00

PAGE 1420

CONFIGURATION DESCRIPTION REFERENCE INFORMATION SQ. FT IN. IN. XT IN. YT IN. ZT MSFC 394(1A33) 740TS (T1P101) ORB STING .45 .40 .35 .30 .20 .15 ĺΟ .10<del>[</del> .05 £ FOREBODY -.10 -.15<del>[</del> -.20 0 MACH NUMBER FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG (F)ALPHA = .00 PAGE 1421

FOREBODY PITCHING MOMENT COEFFICIENT.



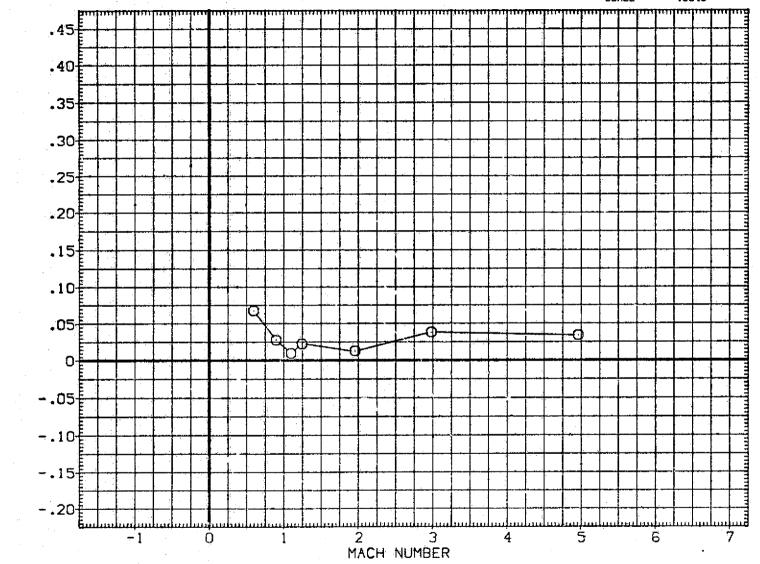


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(G)ALPHA = 2.00 PAGE 1422

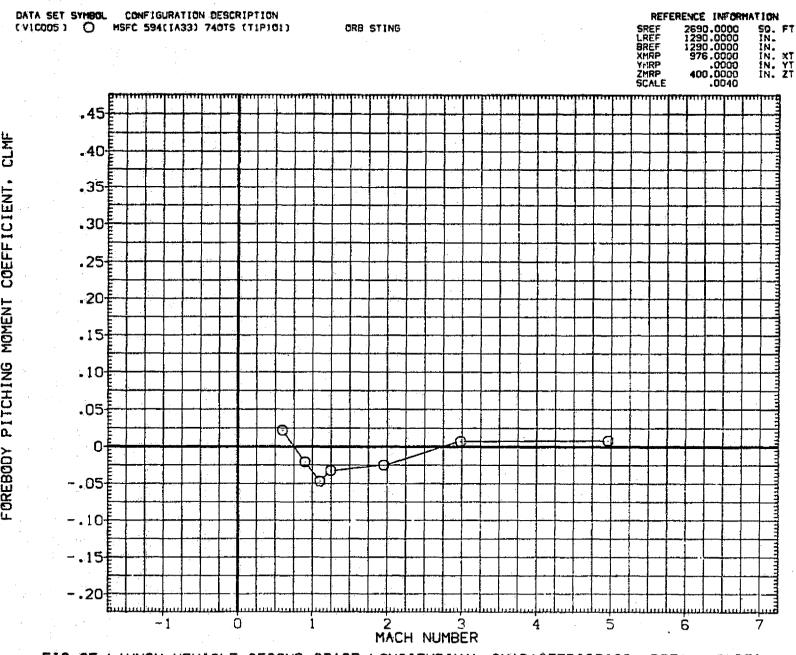


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS. BETA = 0 DEG
(H)ALPHA = 4.00
PAGE 1423

FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(I)ALPHA = 6.00

PAGE 1424

MACH NUMBER

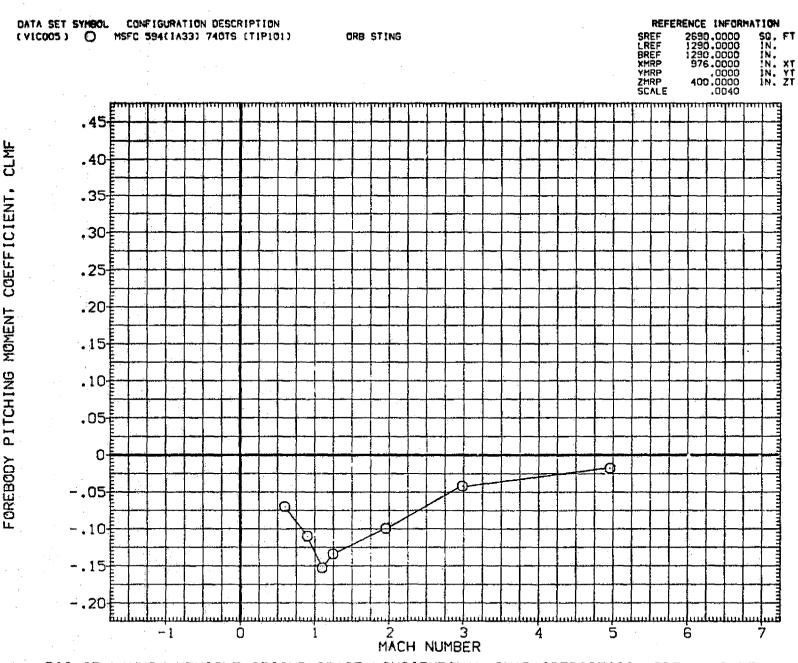
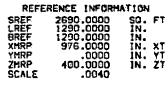


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG

(J)ALPHA = 8.00

PAGE 1425

COEFFICIENT



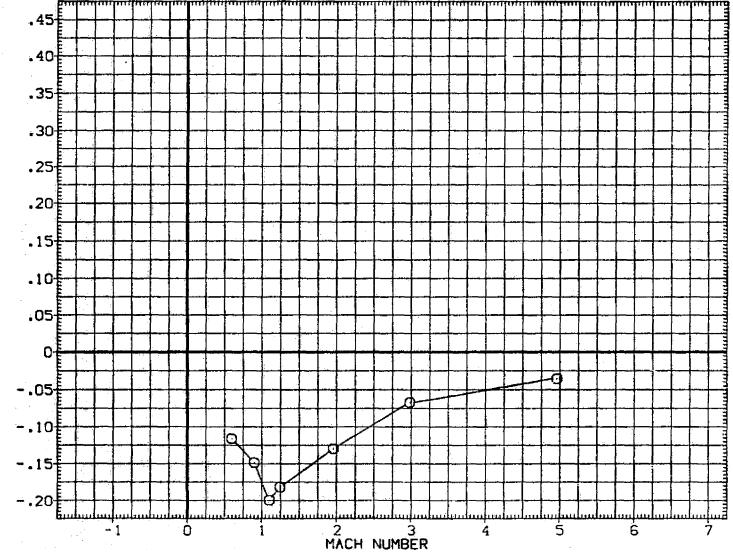
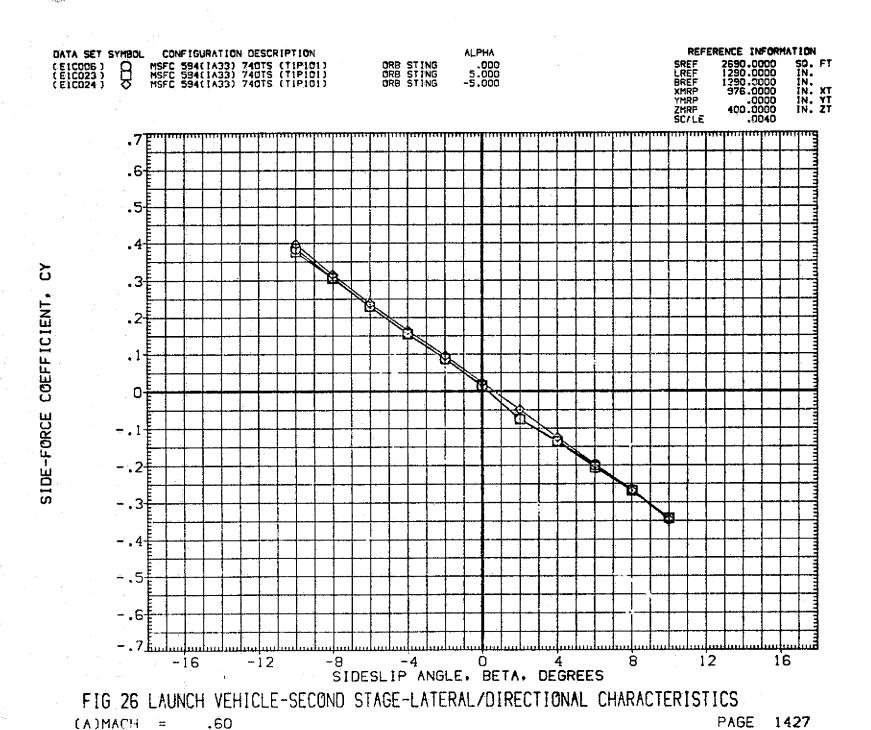


FIG 25 LAUNCH VEHICLE-SECOND STAGE-LONGITUDINAL CHARACTERISTICS, BETA = 0 DEG
(K)ALPHA = 10.00 PAGE 1426



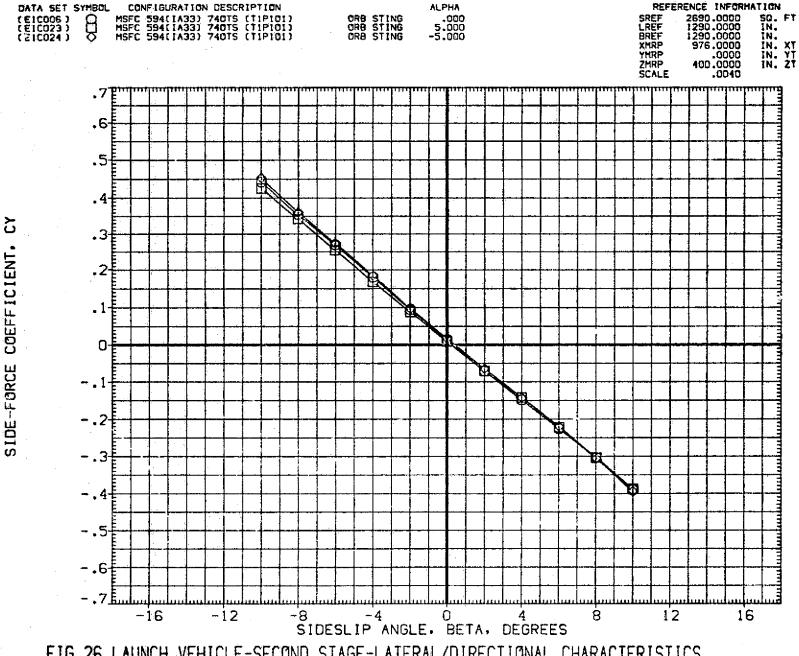


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(B)MACH = .90

PAGE 1428

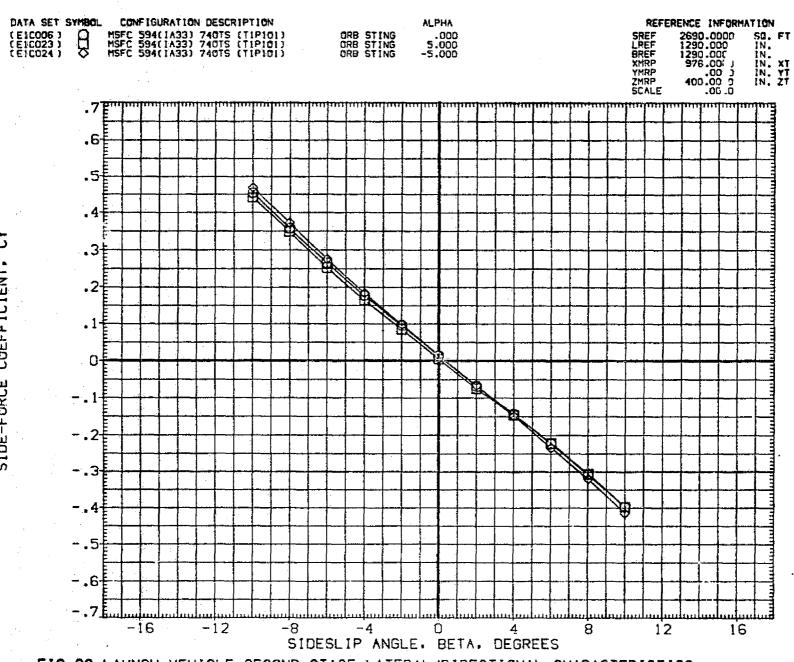
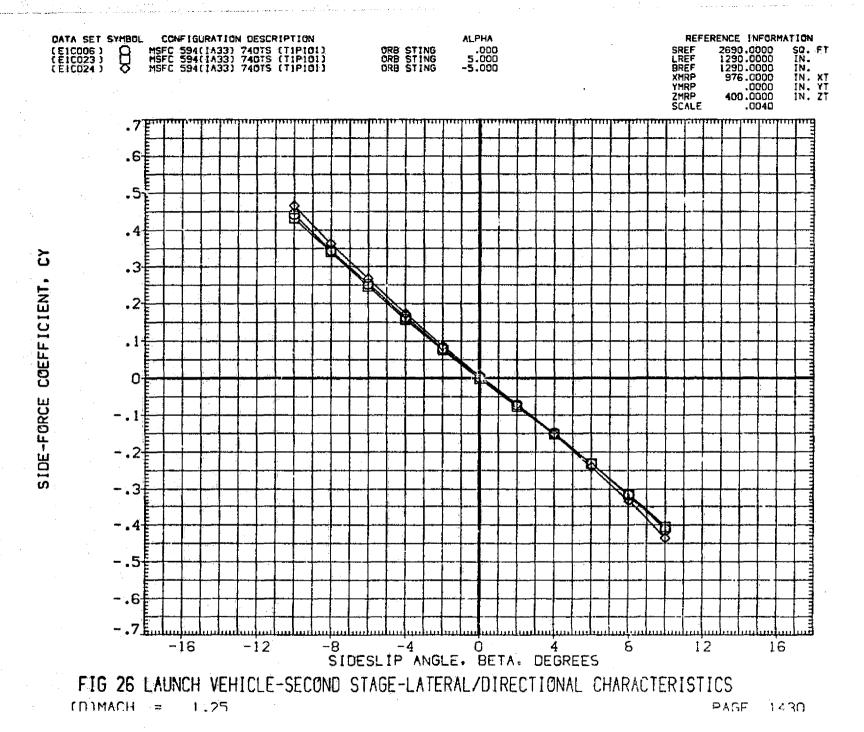


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

[C]MACH = 1.10

PAGE 1429



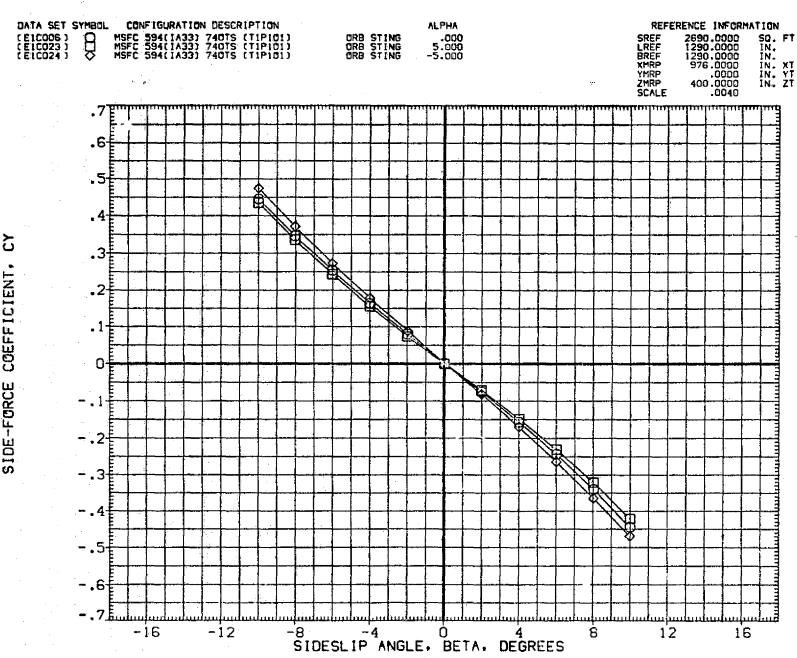
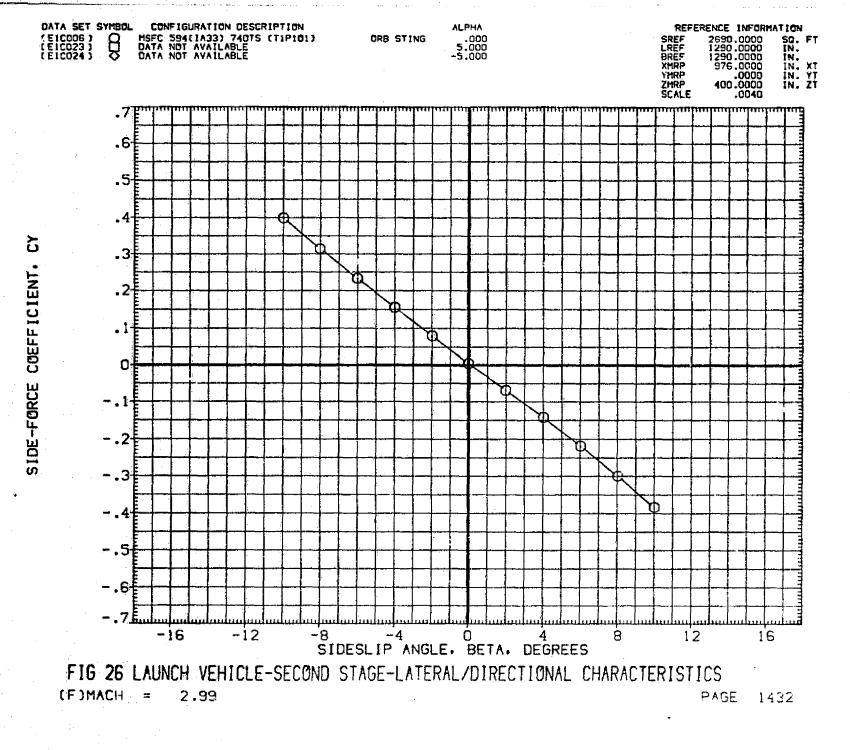


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(E)MACH = 1.96

PAGE 1431



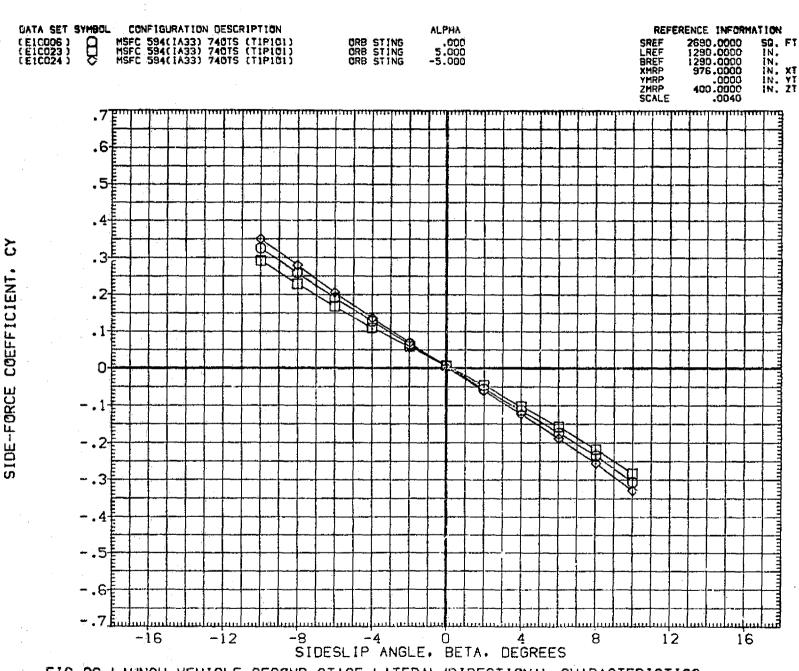


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(G)MACH = 4.96

PAGE 1433

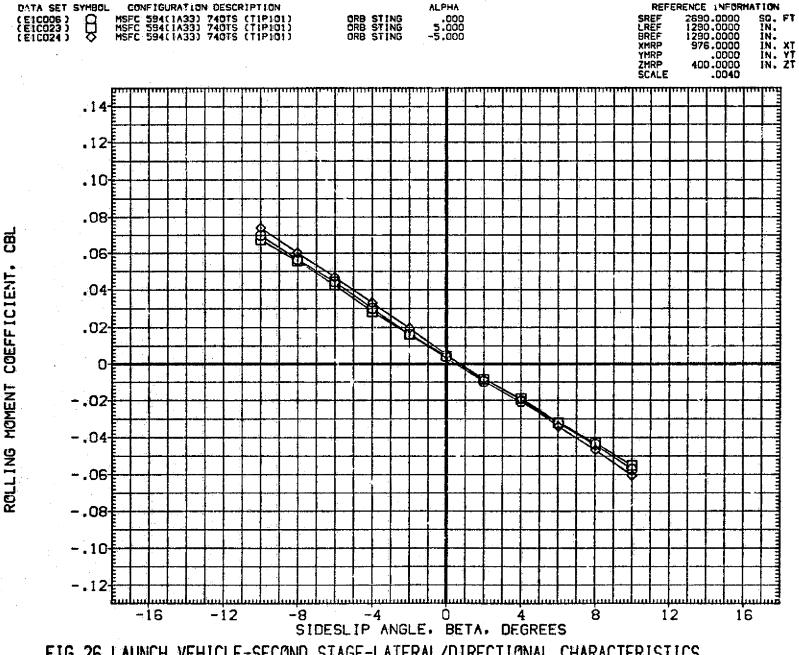


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

[A)MACH = .60

PAGE 1434

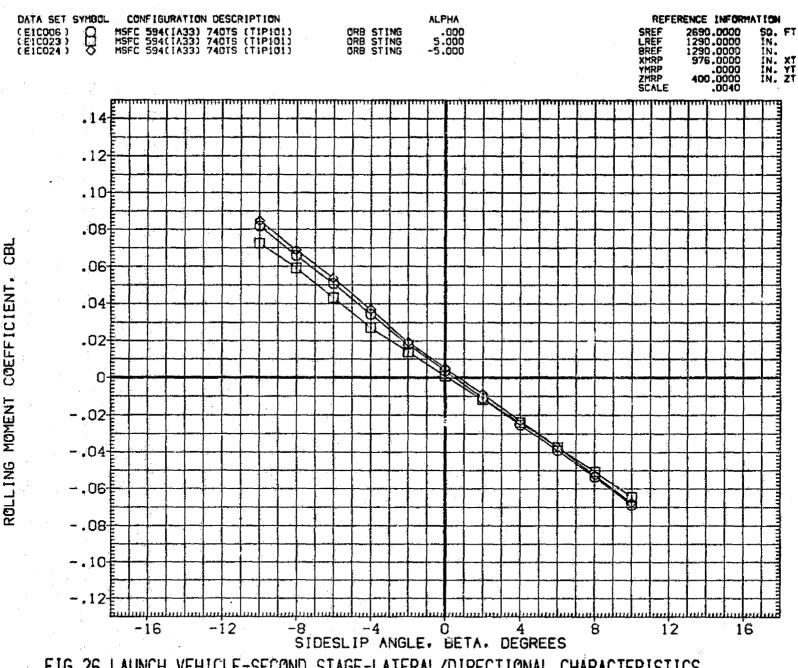
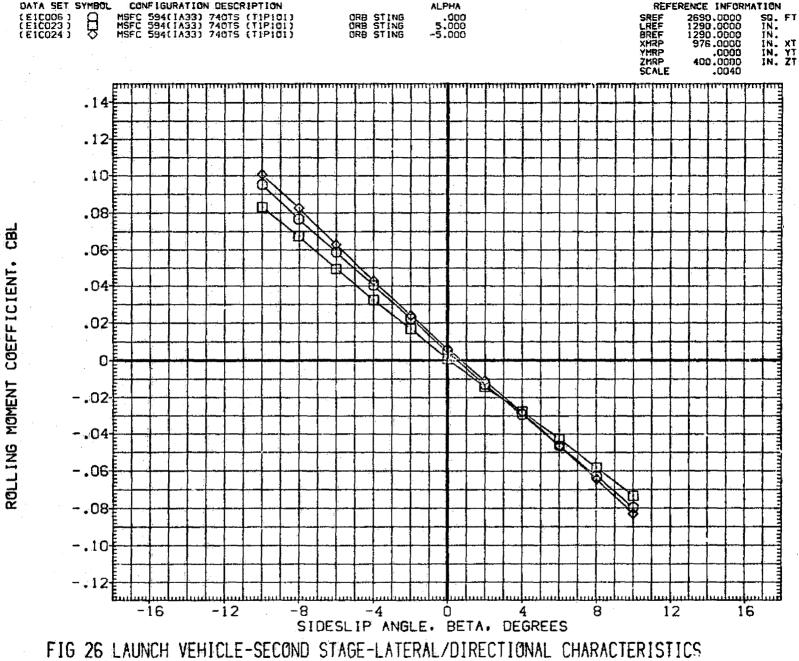


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(B)MACH = .90 PAGE 1435

**,我们就是一个人,我们就是一个人,我们就是一个人,我们就是一个人,我们就是一个人,我们就是一个人,我们就是一个人,我们就是一个人,我们就是一个人,我们就是一个** 



(C)MACH = 1.10

PAGE 1436

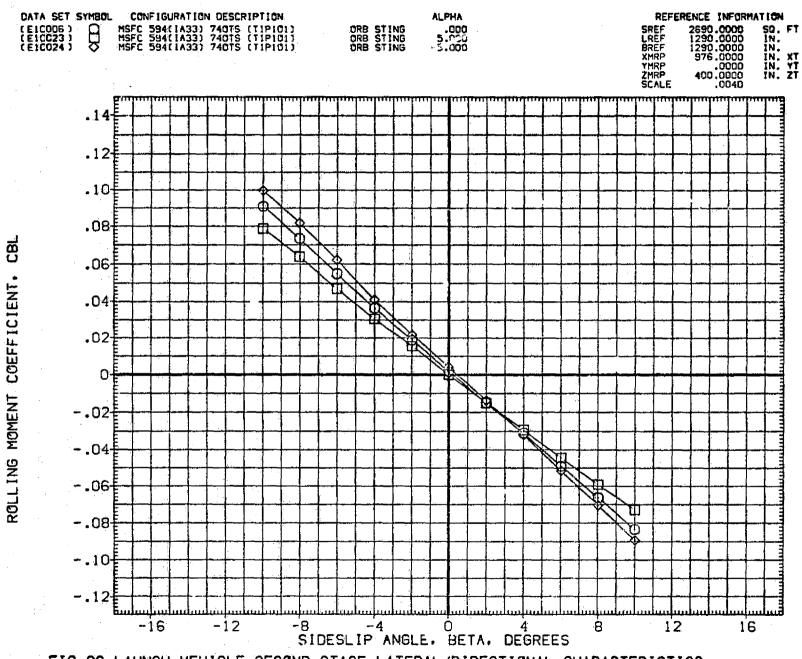


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

[D]MACH = 1.25

PAGE 1437

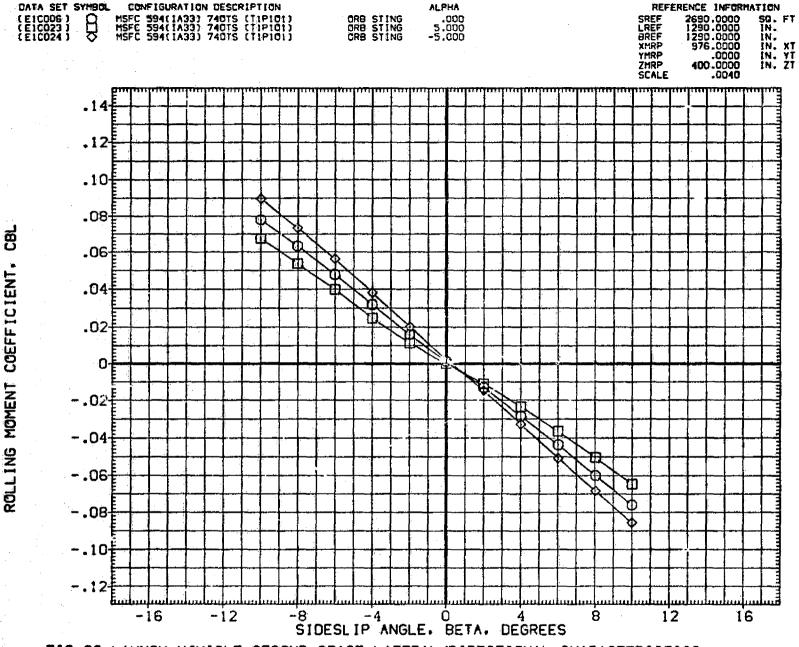


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(E)MACH = 1.96

PAGE 1438

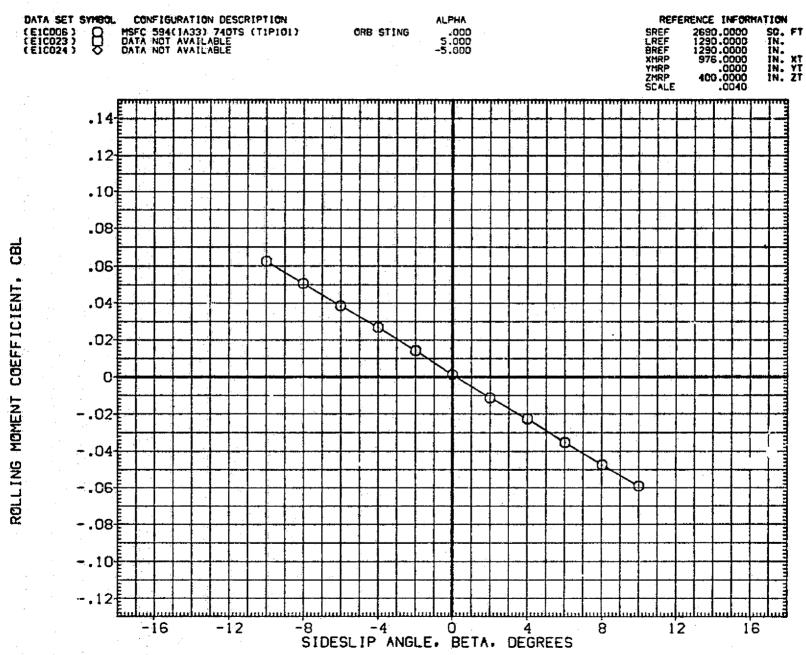
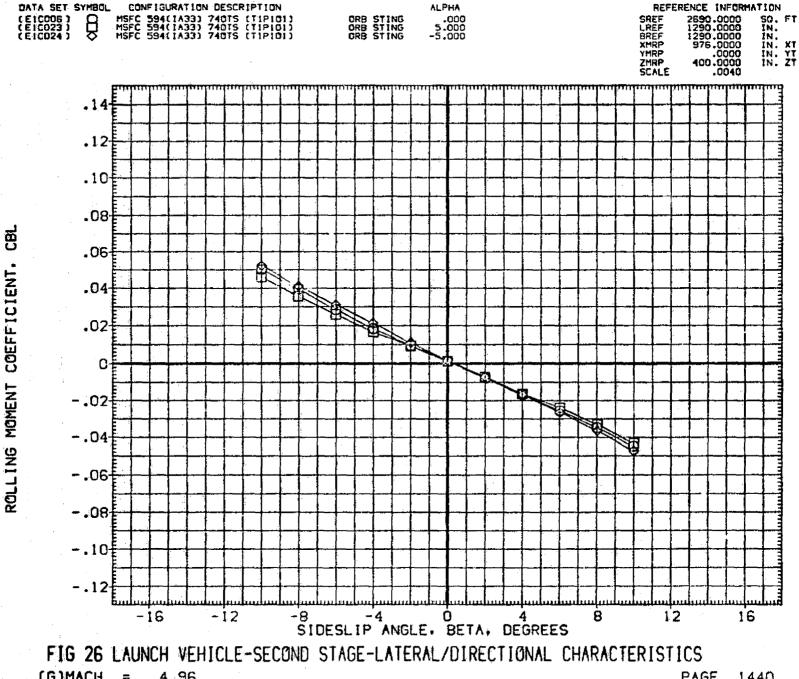


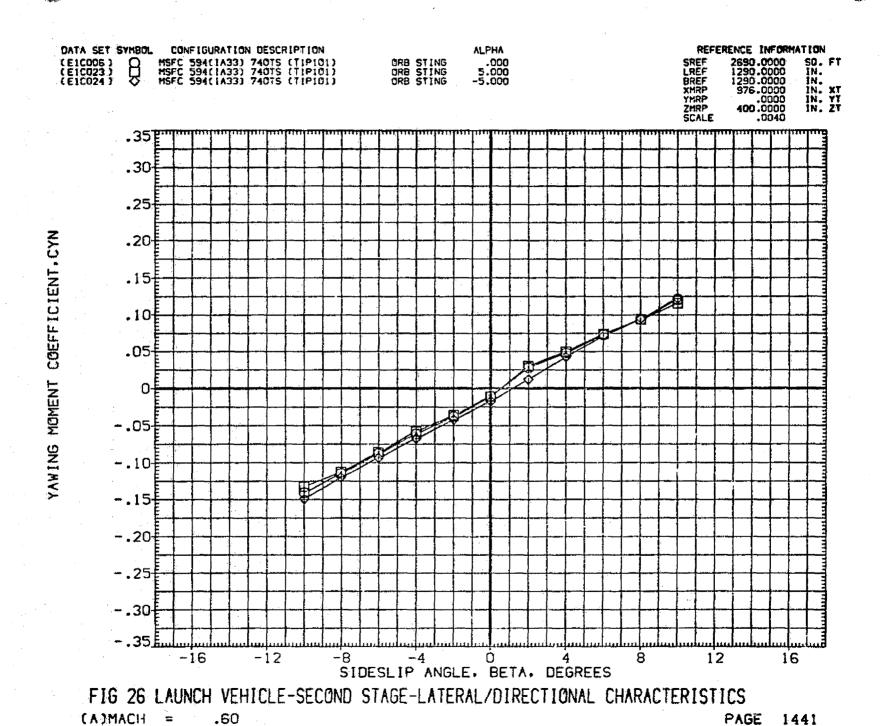
FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

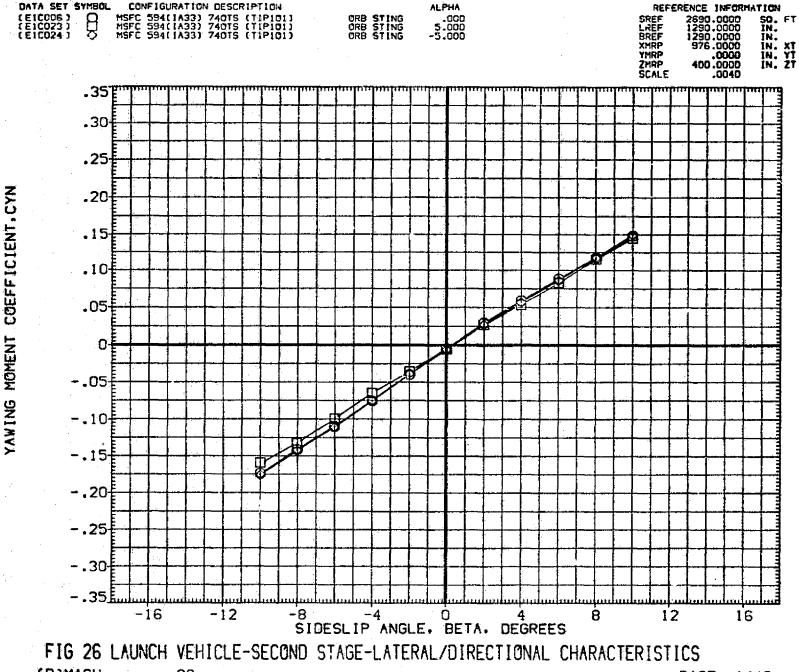
(F)MACH = 2.99

PAGE 1439



(G)MACH = PAGE 1440





(B)MACH PAGE 1442

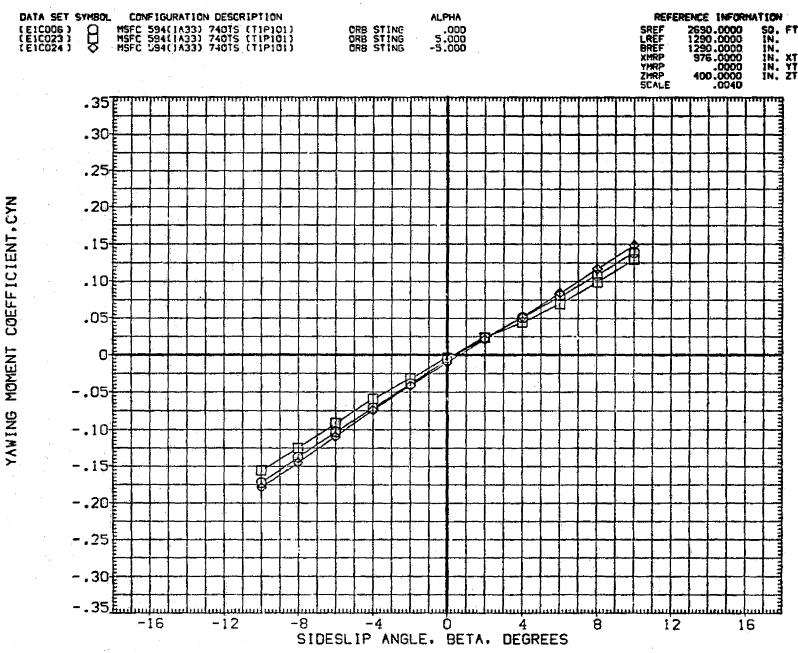


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(C)MACH = 1.10

PAGE 1443

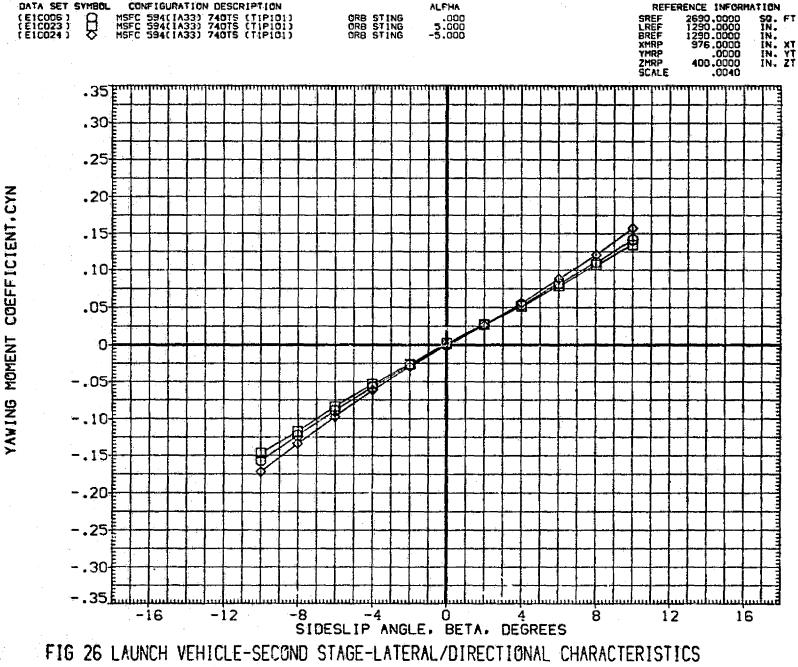
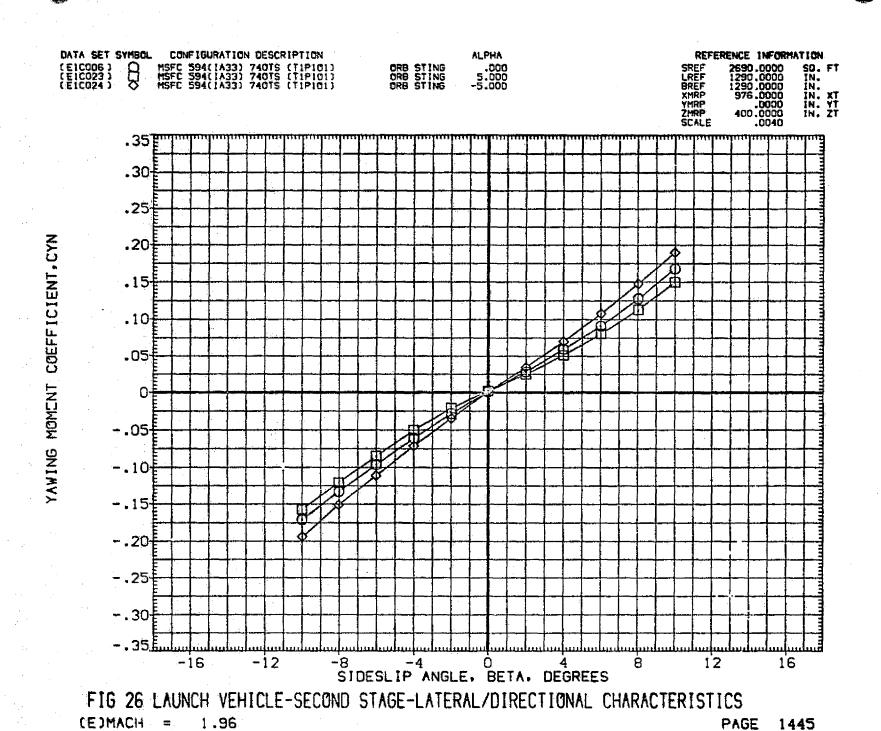
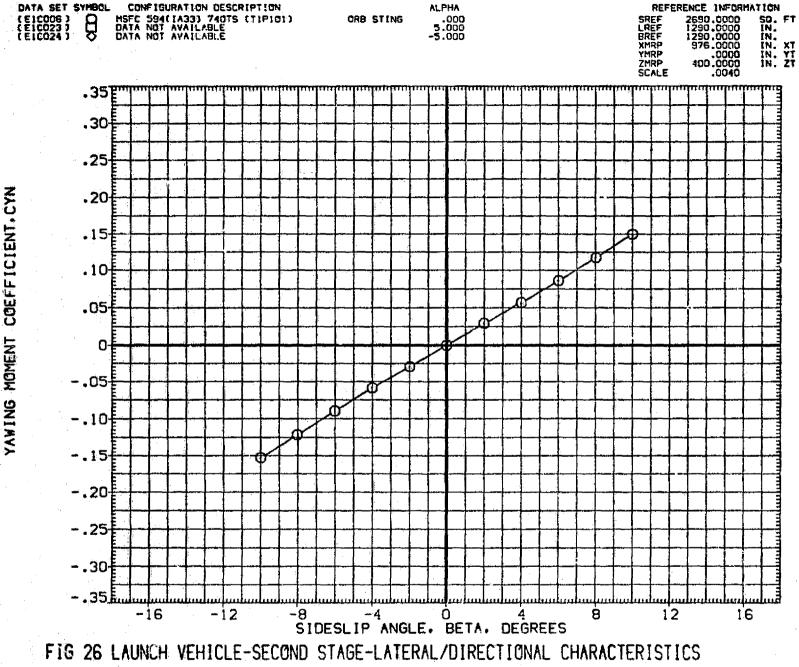


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

[D]MACH = 1.25

PAGE 1444





CF )MACH = 2.99 PAGE 1446

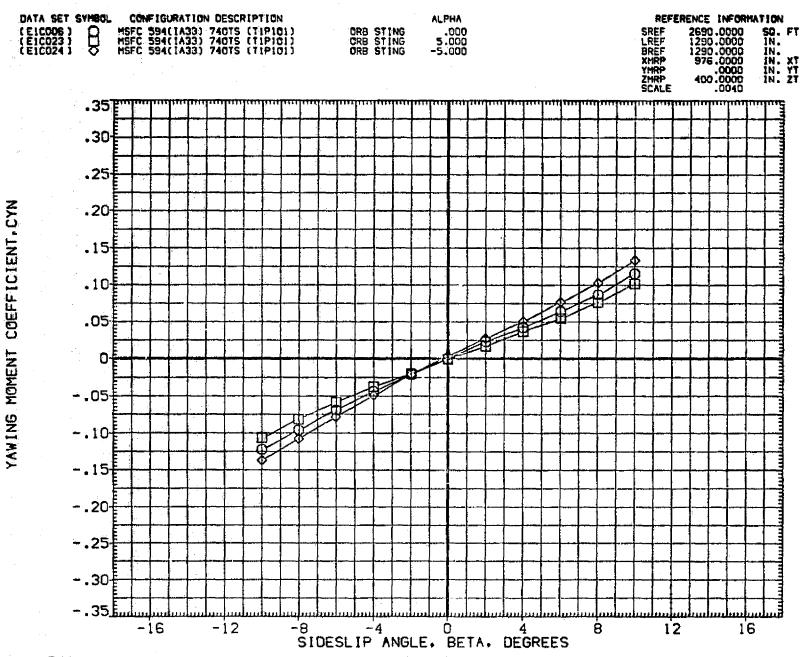
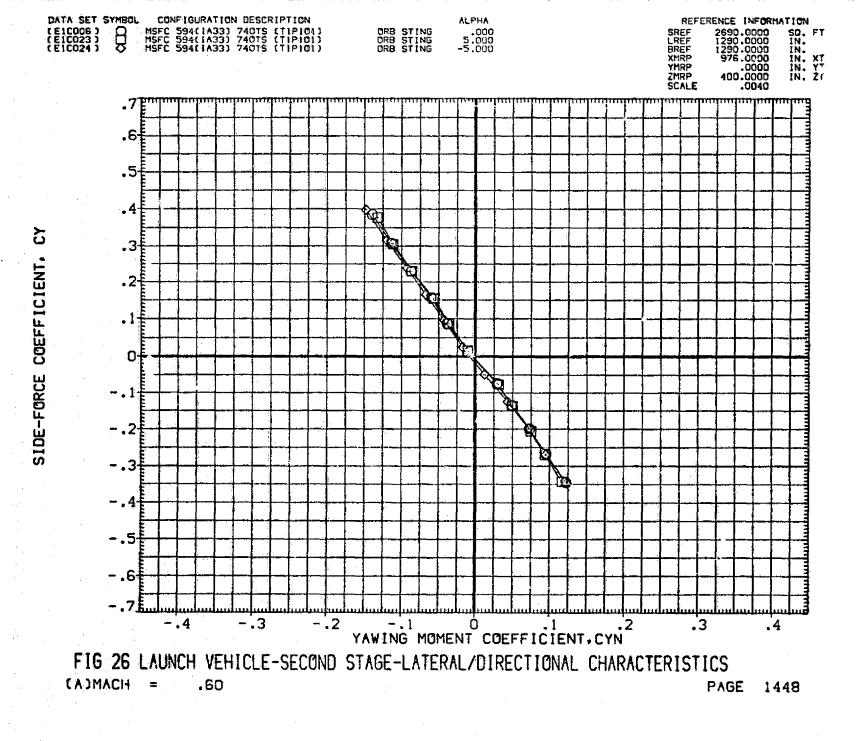
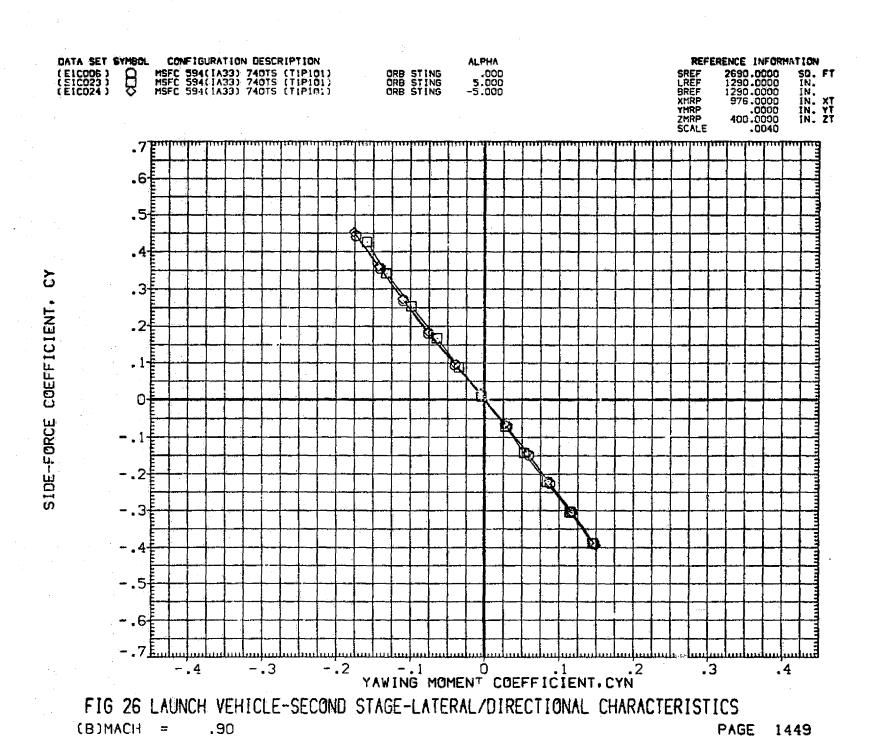


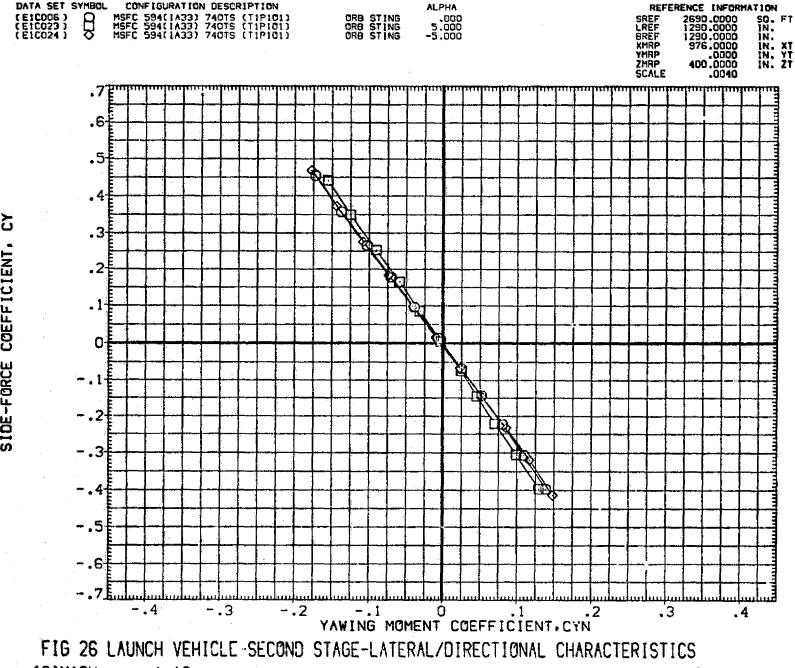
FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(G)MACH = 4.96

PAGE 1447







(C)MACH = 1.10PAGE 1450

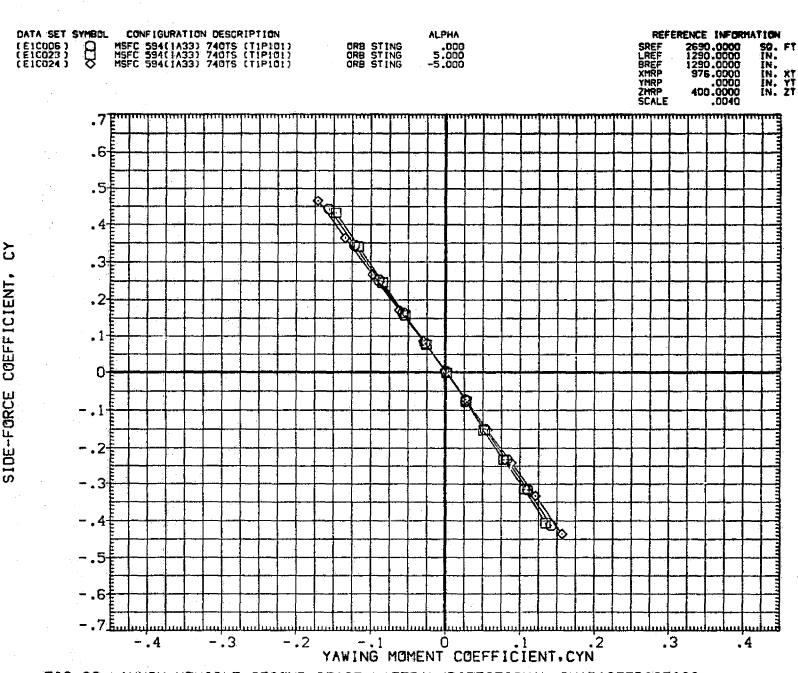
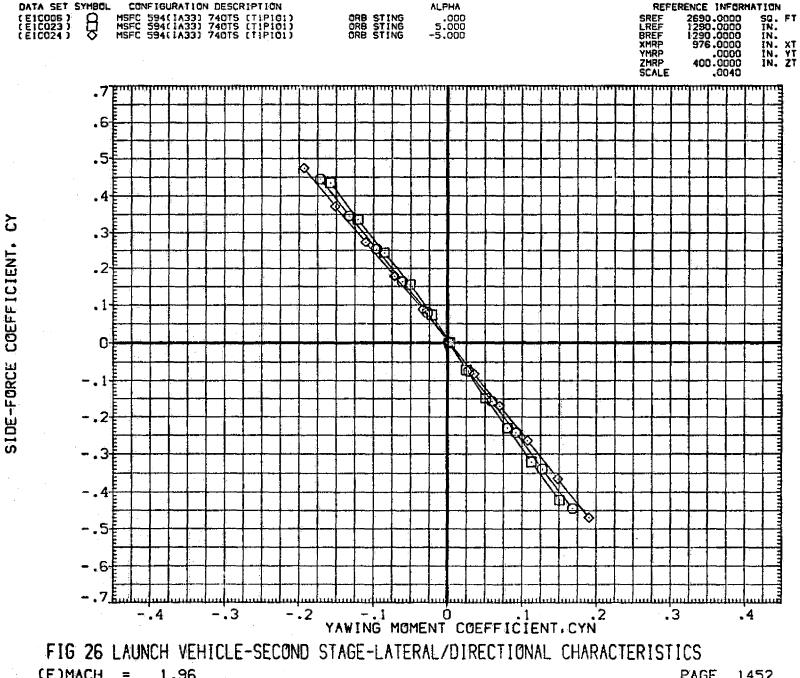


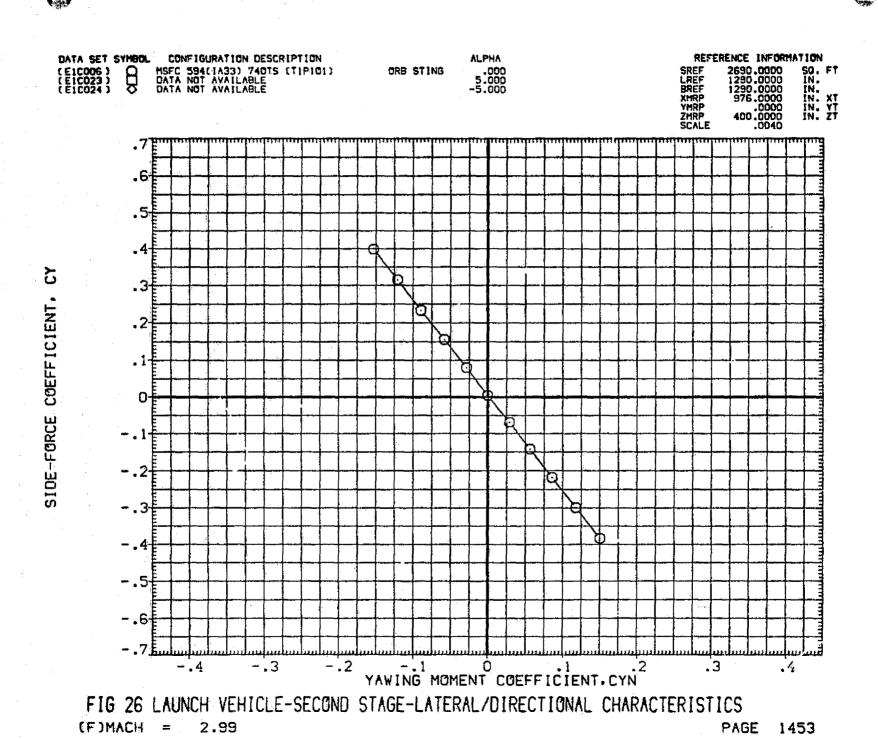
FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(D)MACH = 1.25

PAGE 1451



(E)MACH = 1.96PAGE 1452



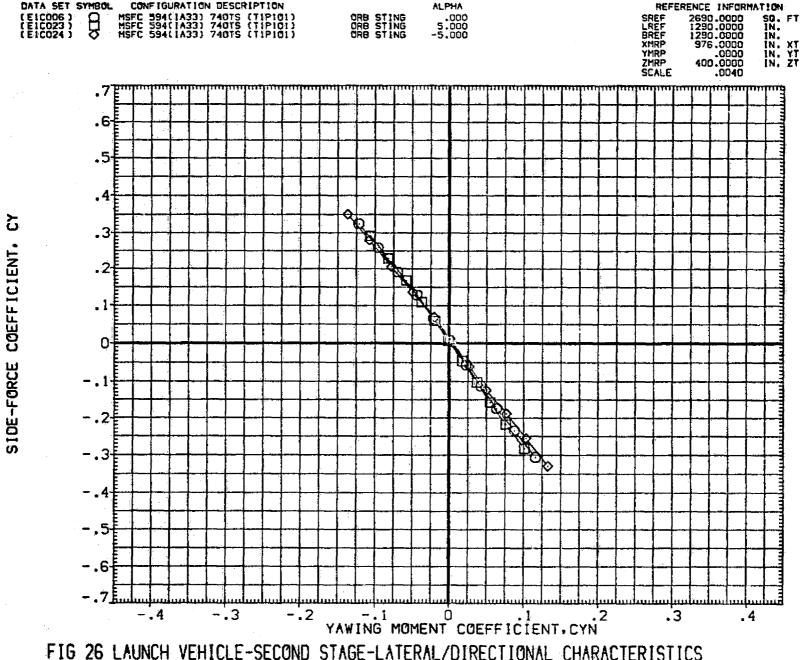


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(G)MACH = 4.96

PAGE 1454

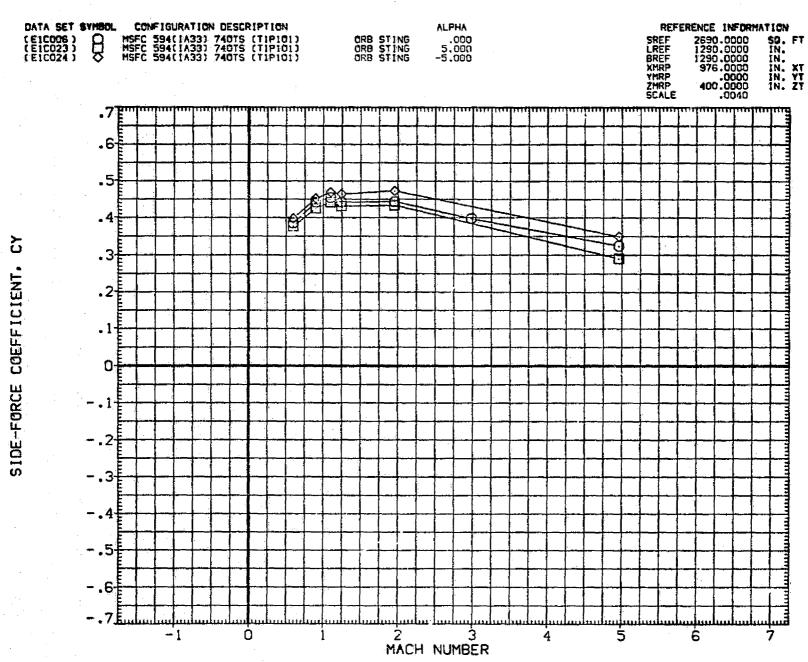


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

 $(A)BET_A = -10.00$ 

PAGE 1455

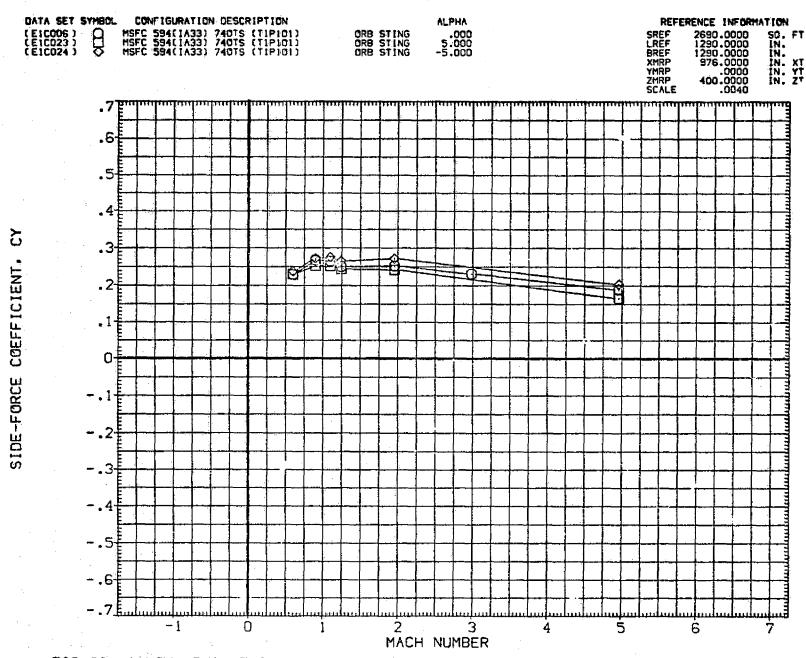
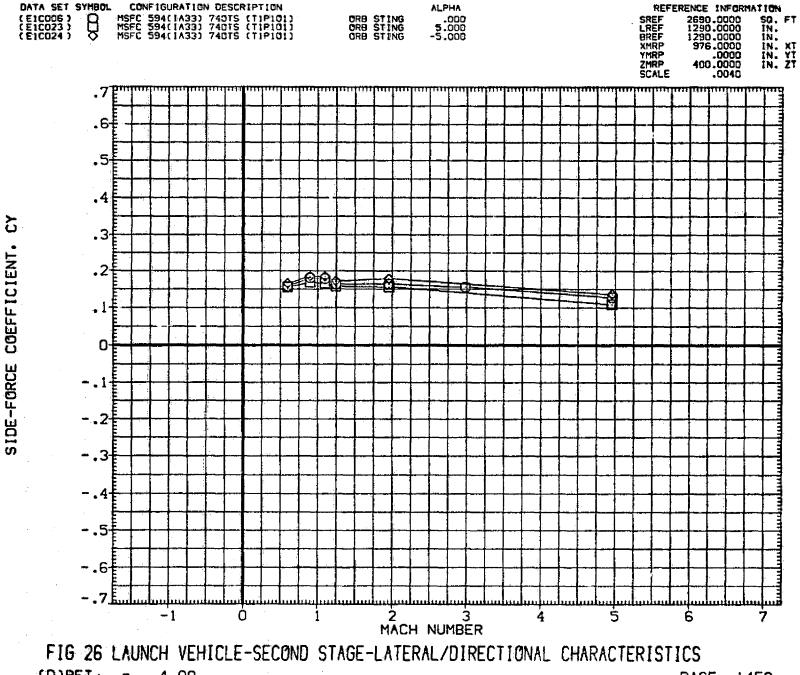


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(C)BETA = -6.00

PAGE 1457

AND THE PROPERTY OF THE PROPER



(D)BET $_{1} = -4.00$ PAGE 1458

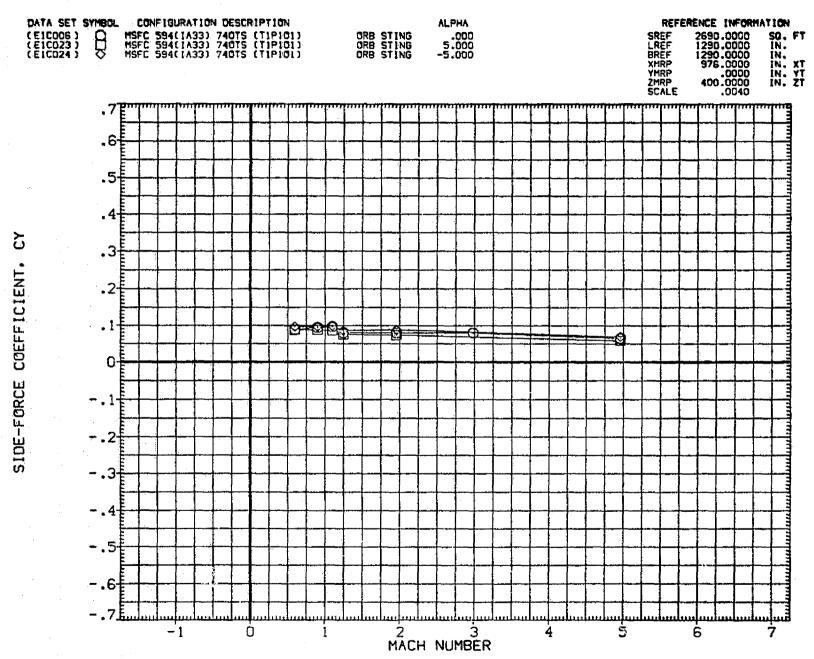
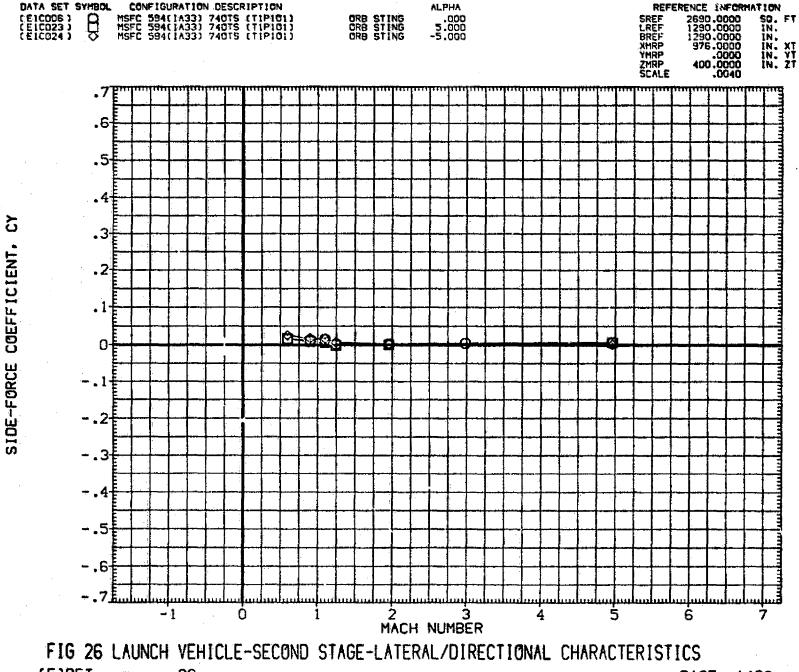


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(E)BETA = -2.00 PAGE 1459



(F)BETA ≈ .00 PAGE 1460

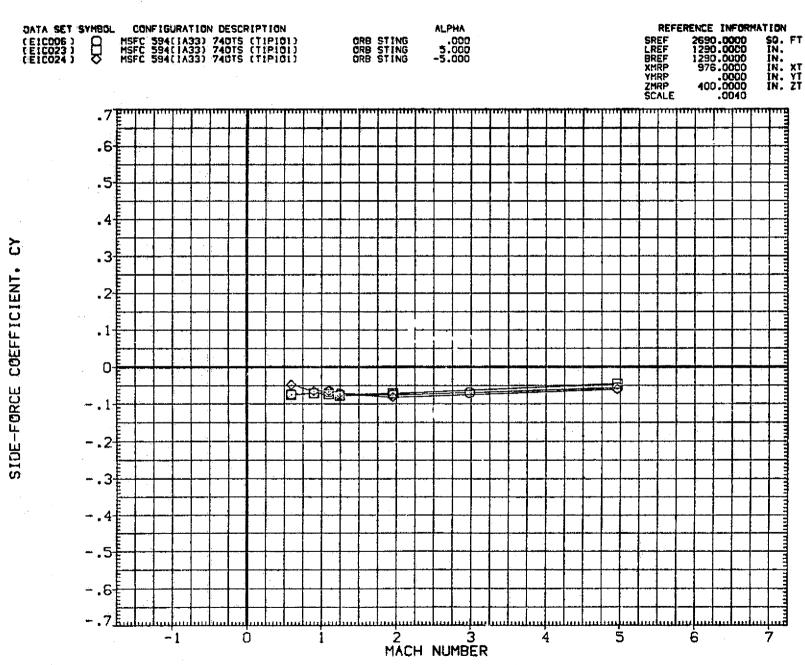
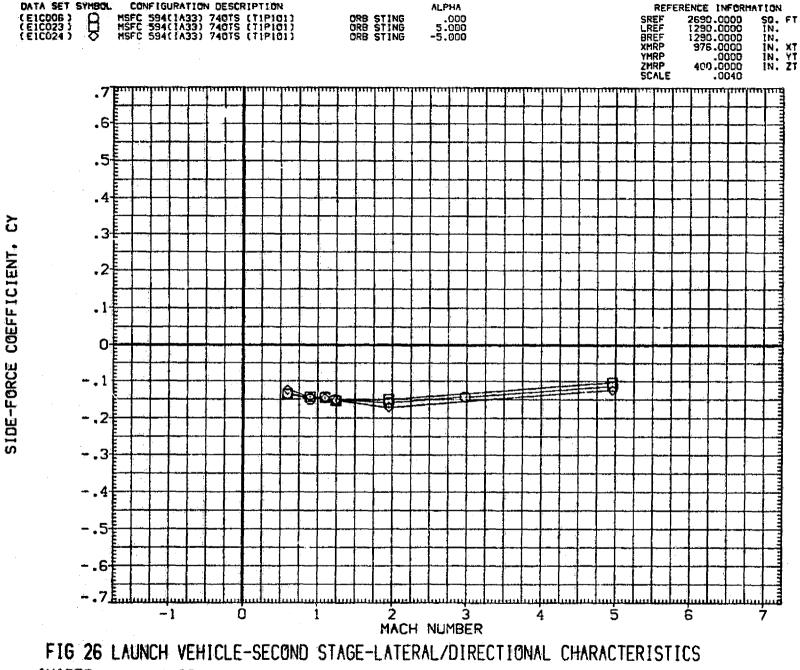


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(G)BET $\alpha = 2.00$ 

the second secon

PAGE 1461



(H)BETA = 4.00PAGE 1462

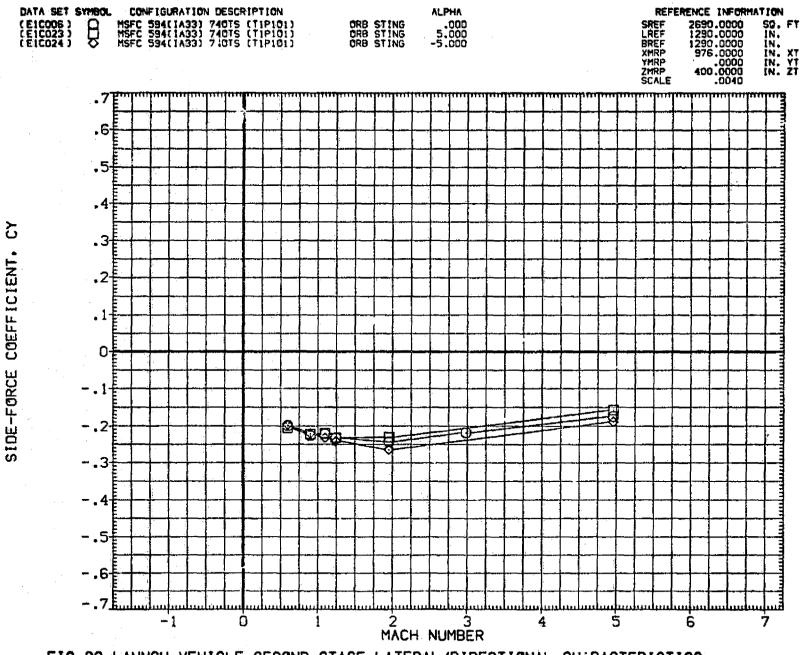
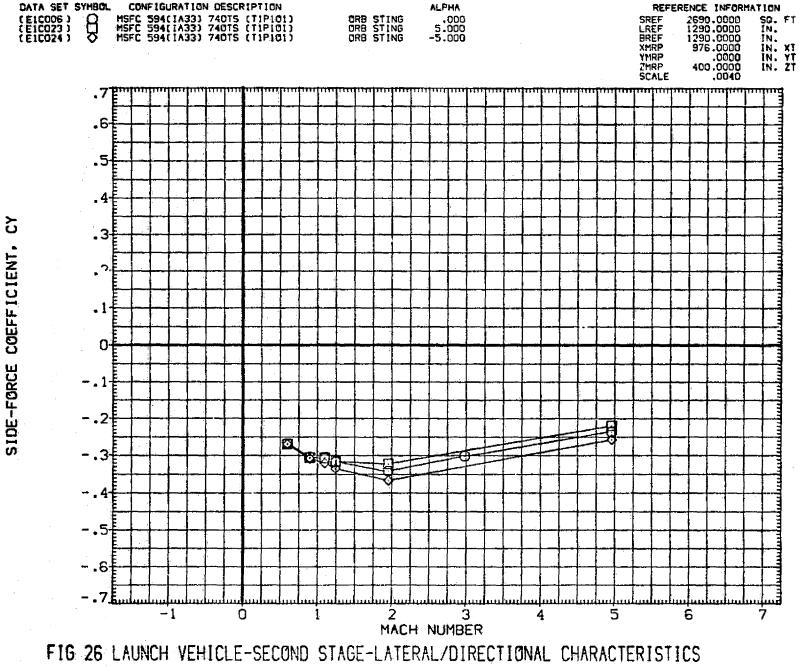


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

PAGE 1463



(J)BETA = 8.00PAGE 1464

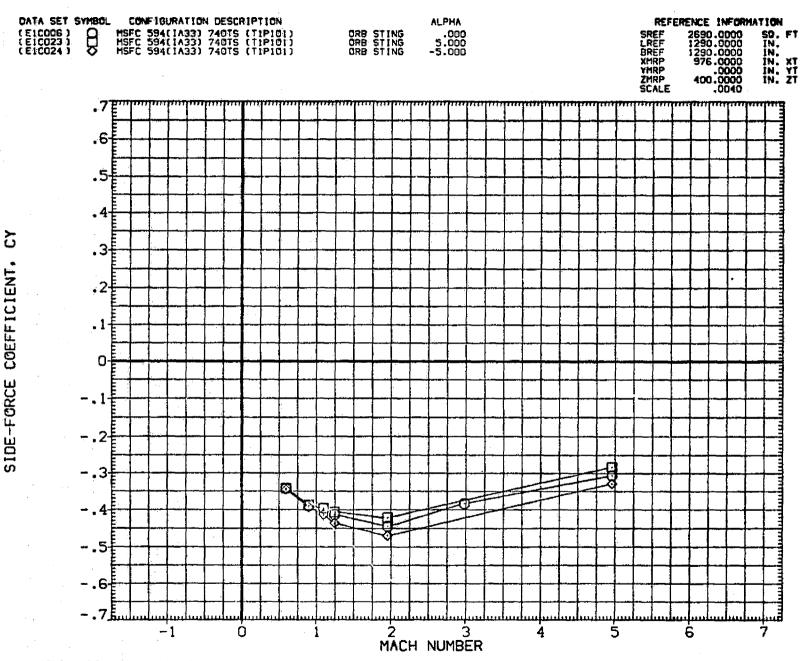


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(K)BETA = 10.00 PAGE 1465

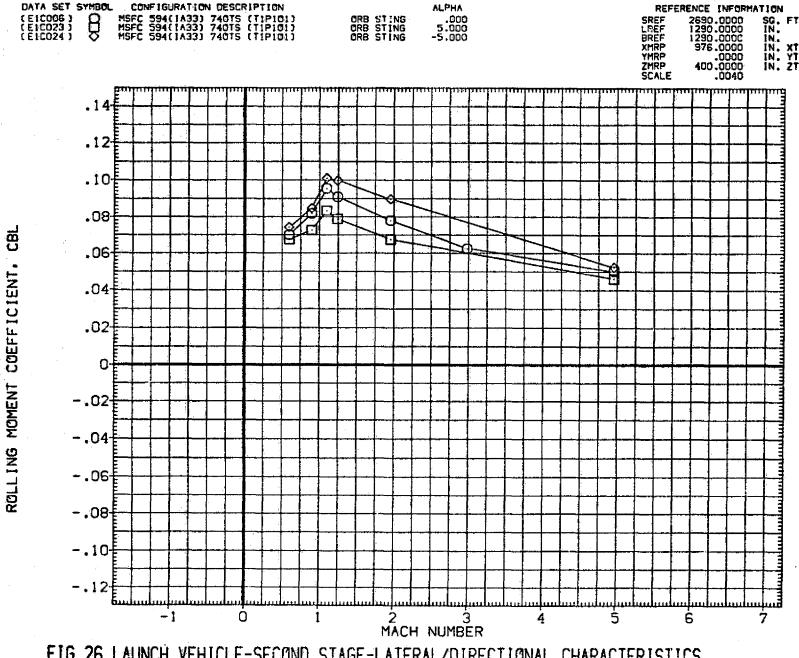
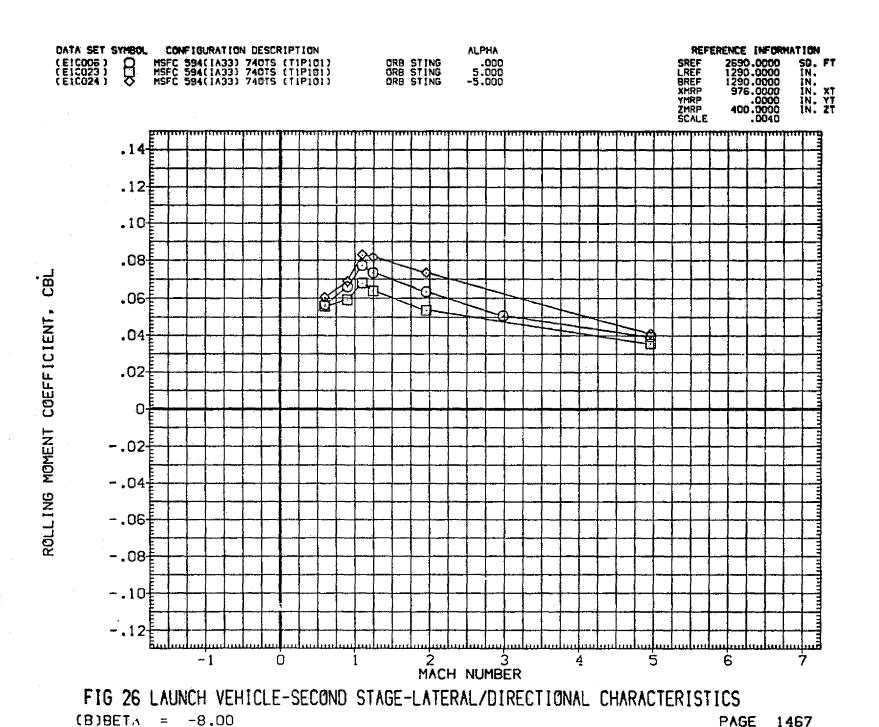


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(A)BETA = -10.00

PAGE 1466



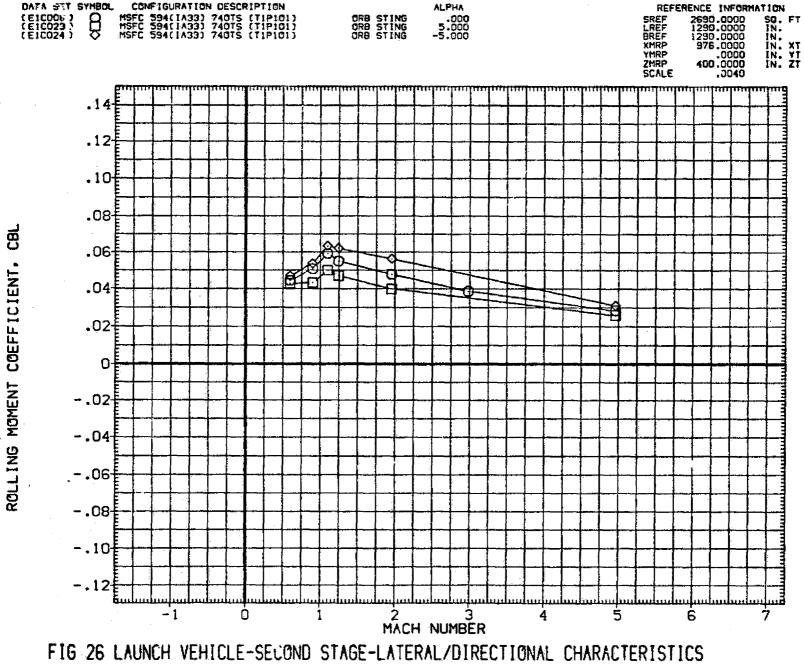


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(C)BETA = -6.00

PAGE 1468

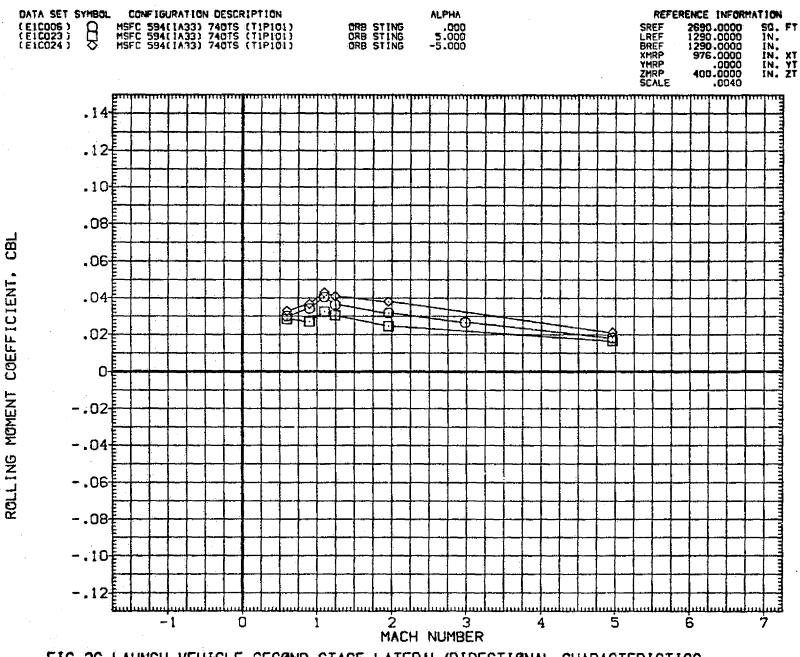


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(D)BETA = -4.00

PAGE 1469

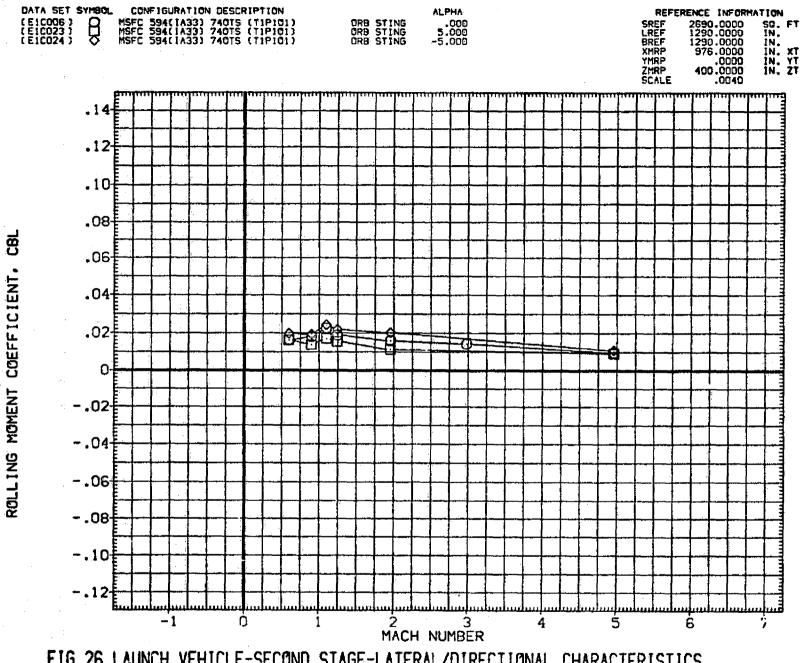


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(E)BETA = -2.00

PAGE 1470

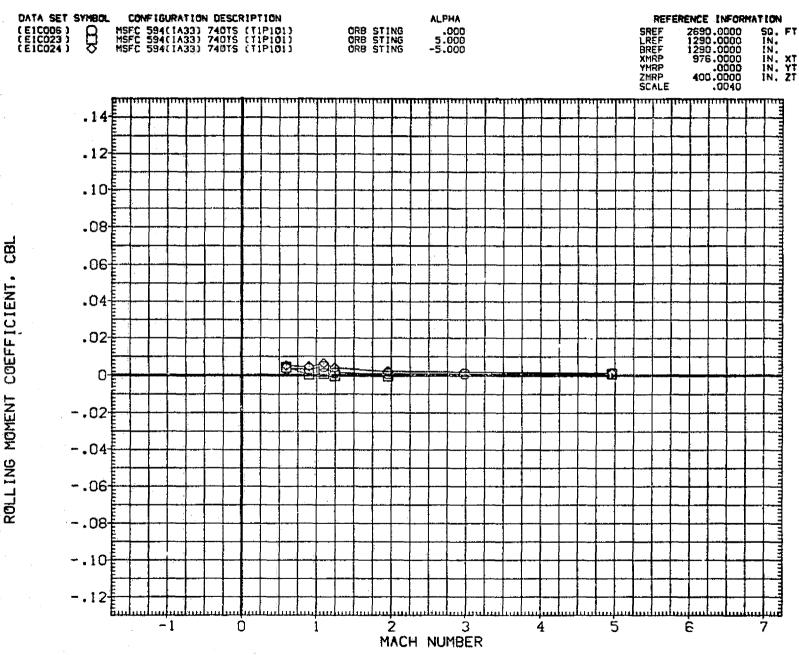


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(F)BETA = .00

PAGE 1471

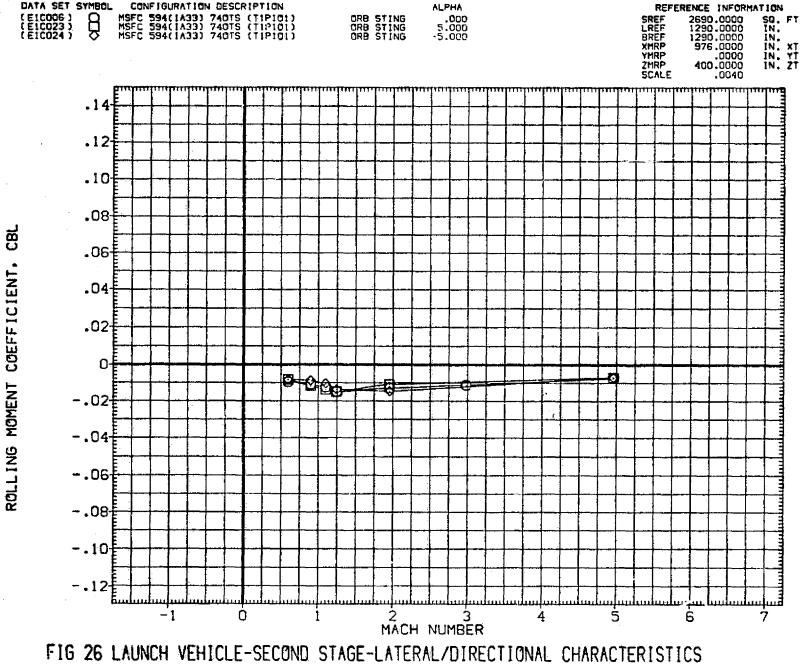


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(G)BETA = 2.00 PAGE 1472

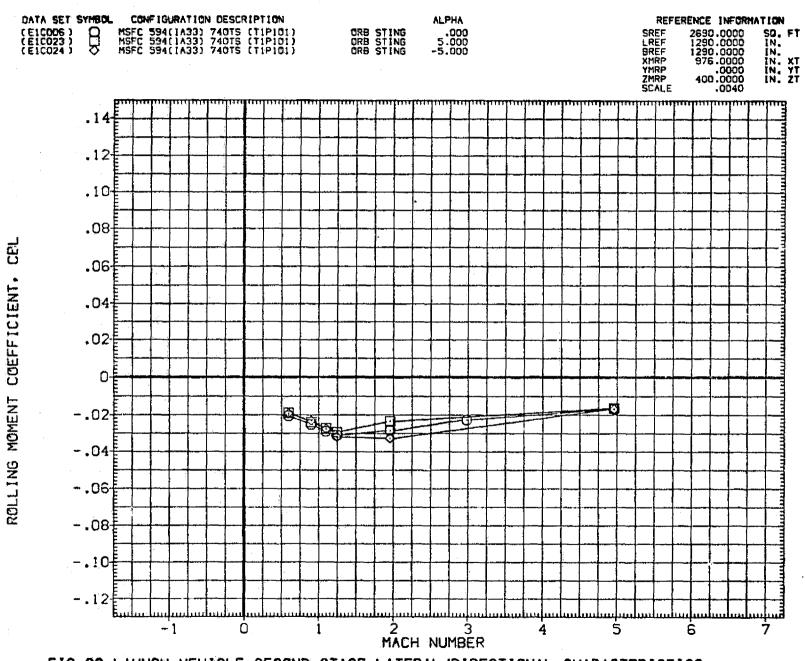


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(H)BETA = 4.00

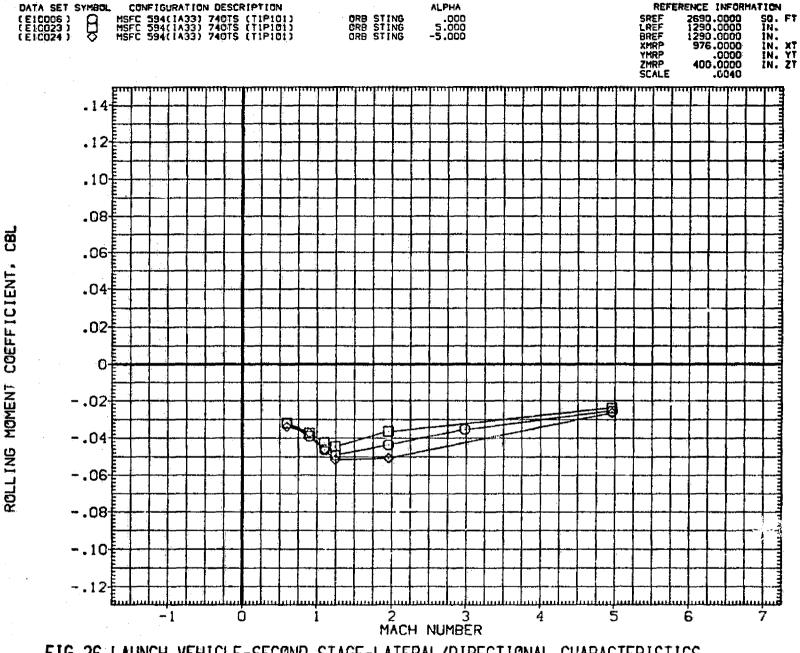


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(I)BETA = 6.00 PAGE 1474

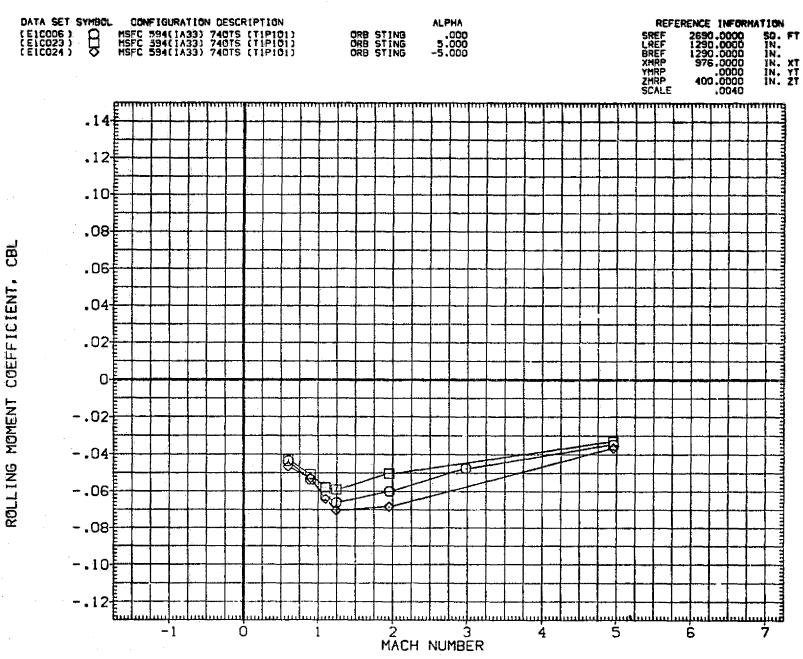


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(J)BETA = 8.00 PAGE 1475

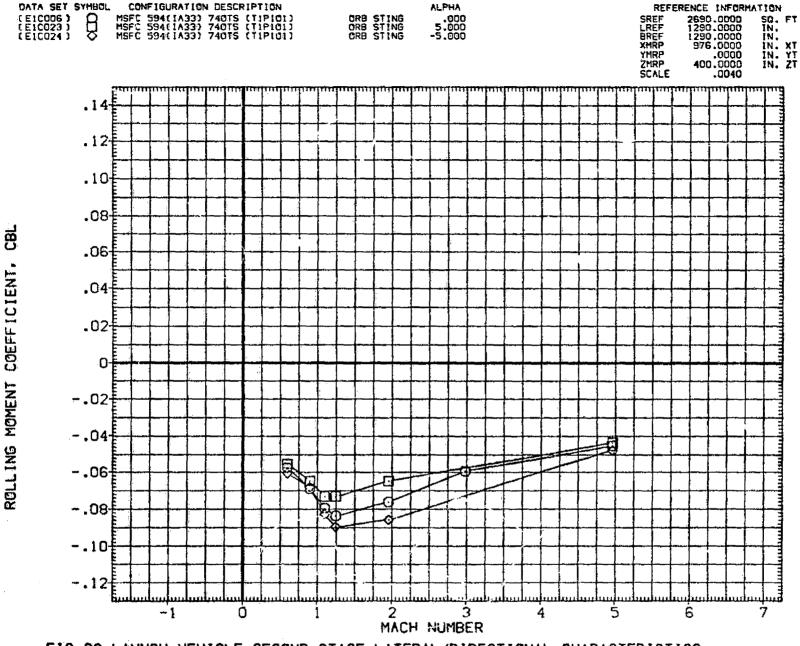


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(K)BETA = 10.00 PAGE 1476

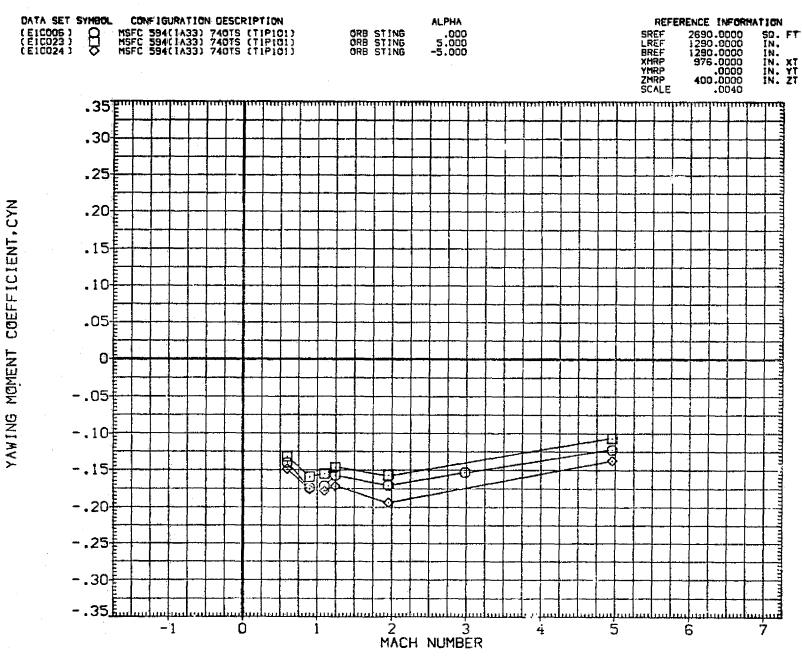


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(A)BETA = -10.00

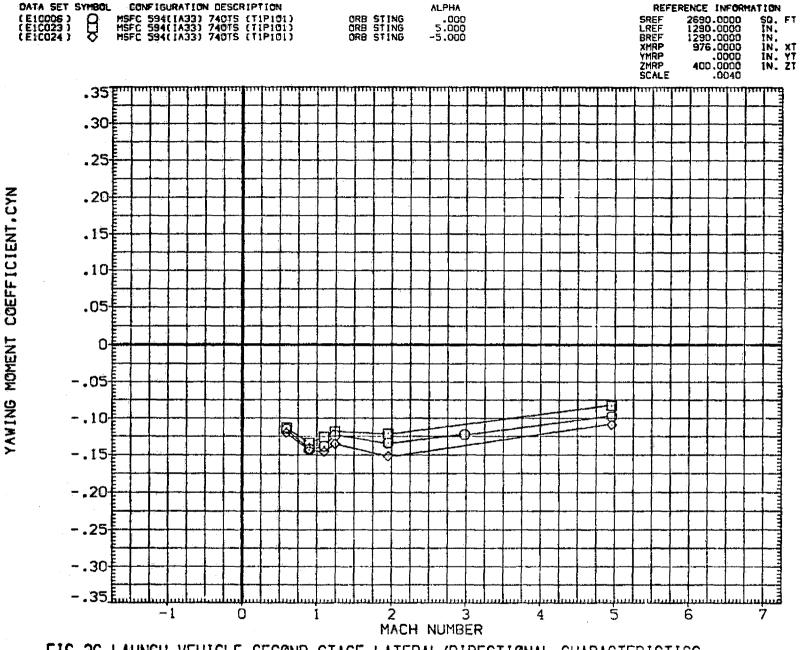


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(B)BETA = -8.00

PAGE 1478

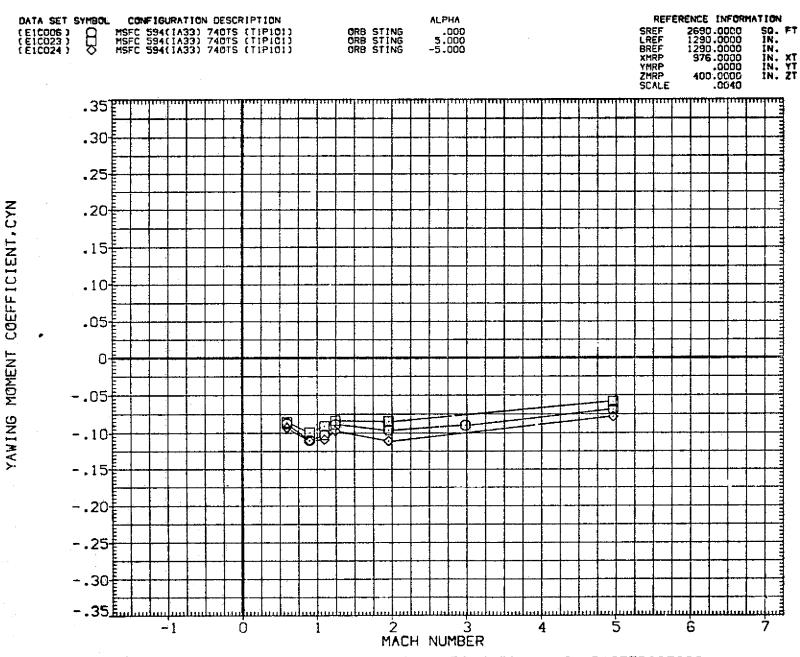


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(C)BETA = -6.00

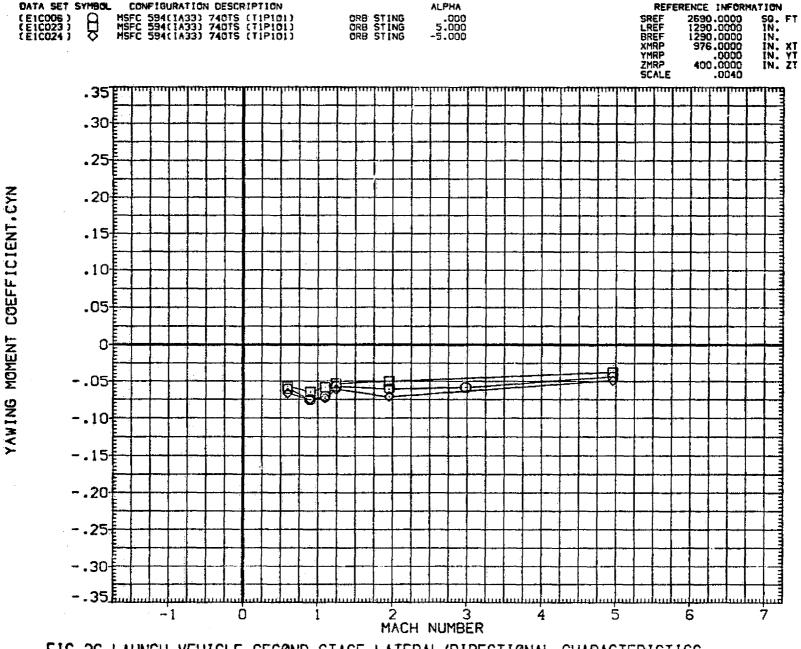


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(D)BETA = -4.00

PAGE 1480

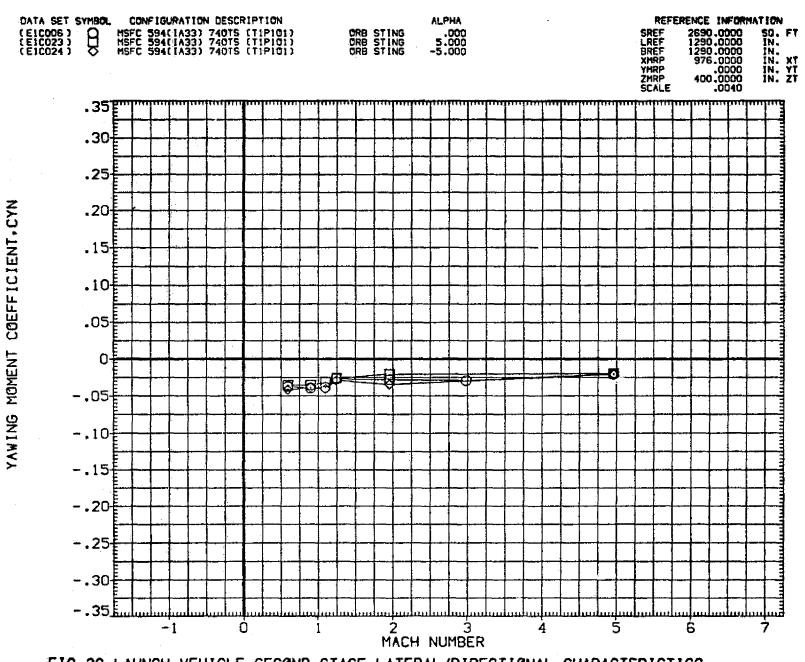


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(E)BETA = -2.00 PAGE 1481

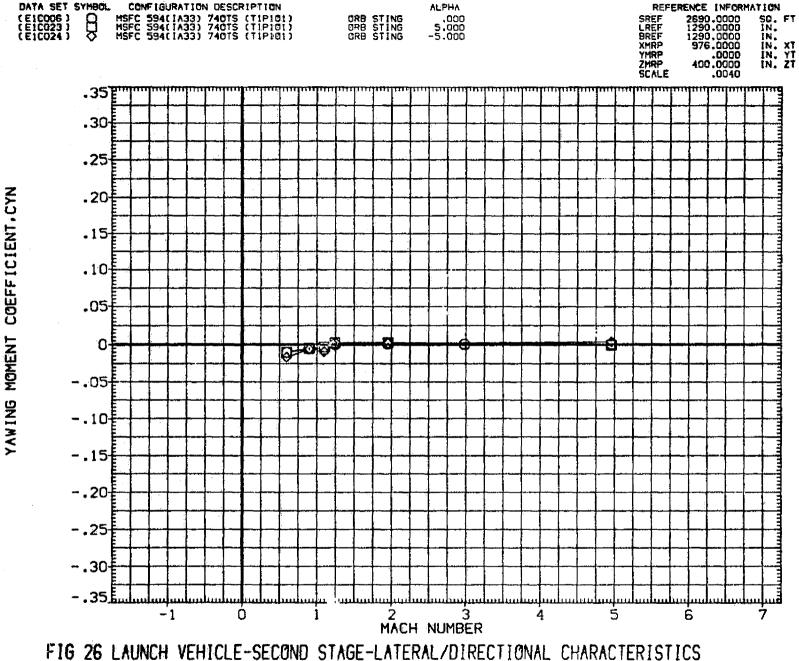


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(F)BETA = .00

PAGE 1482

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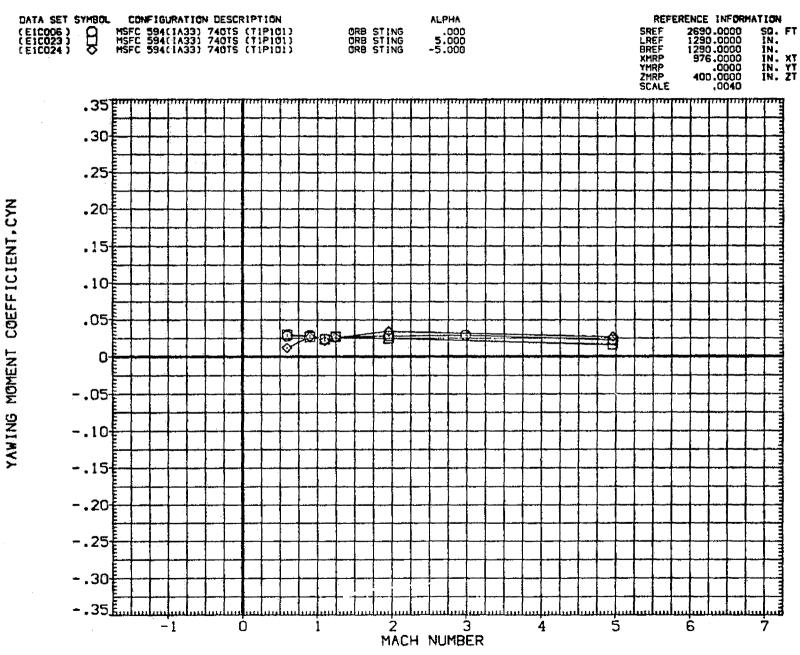


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(G)BETA = 2.00

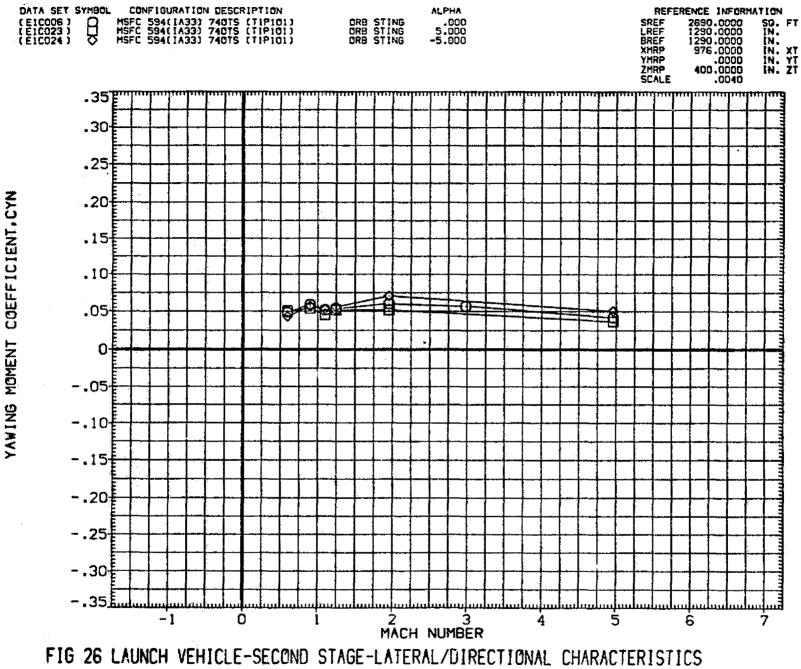


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(H)BETA = 4.00

PAGE 1484





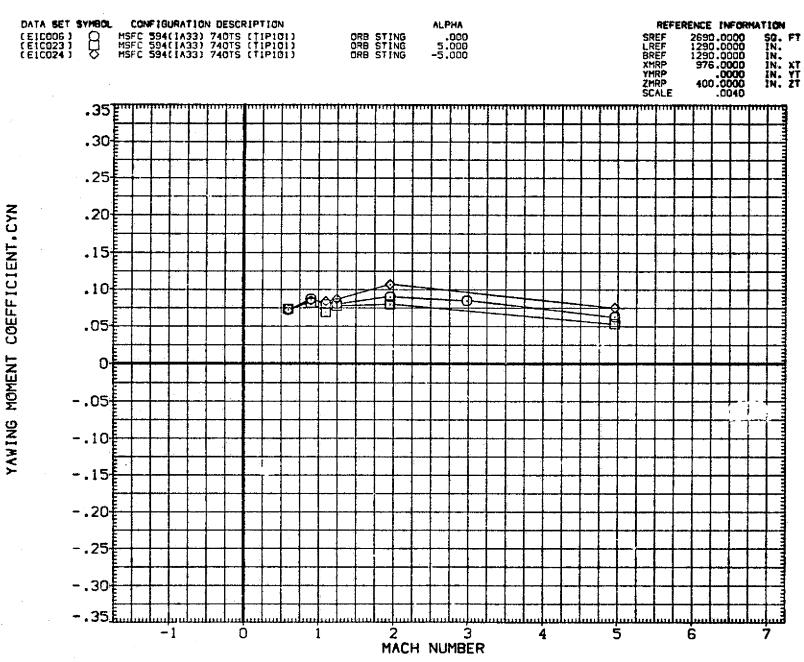
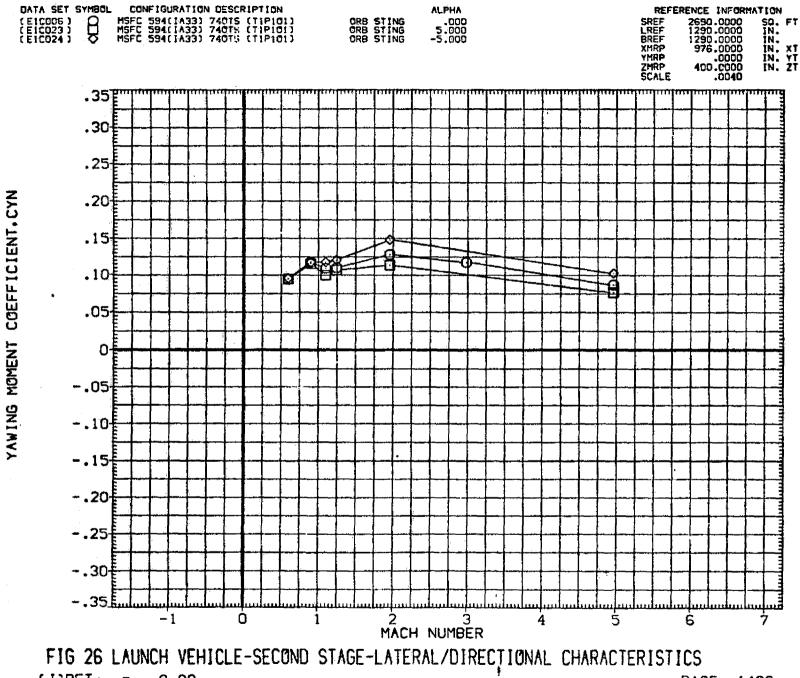


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(I) $BET_A =$ 

PAGE 1485 And the second s



(J)BETA = 8.00PAGE 1486



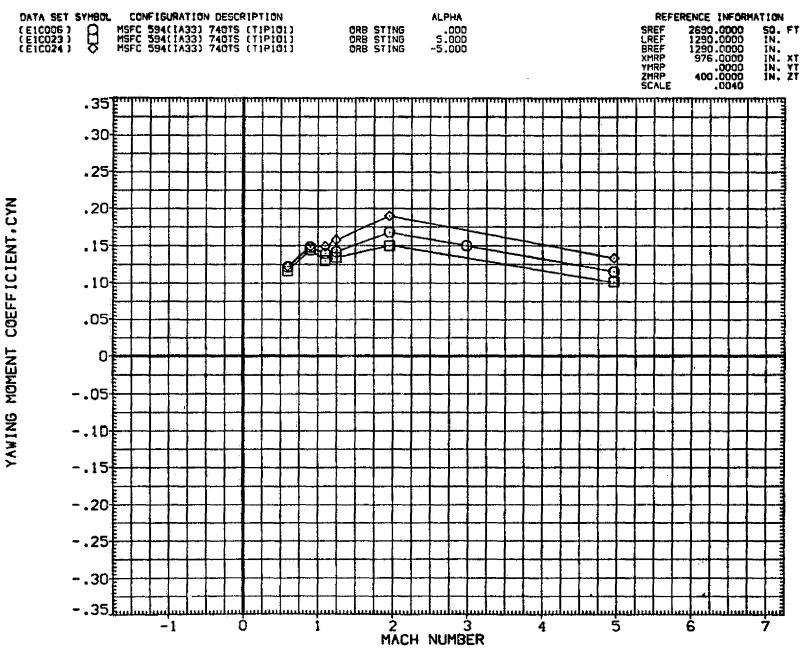


FIG 26 LAUNCH VEHICLE-SECOND STAGE-LATERAL/DIRECTIONAL CHARACTERISTICS

(K)BETA = 10.00 PAGE 1487